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RECENT MOUNTAINEERING IN THE CANADIAN ALPS

By CHARLES E. FAY
Past President, Appalachian Mountain Club and American Alpine Club

The development of the splendid alpine district of western Canada as a field of mountaineering began in 1888, almost coincident with the completion of the Canadian Pacific Railway. For the first two decades a few lovers of the sport, some from England and Switzerland, but chiefly from the eastern United States, were enthusiastic explorers of the peaks and passes of a limited region comprised for the greater part within what is technically known as "the Railway Belt," the territory extending for twenty miles on either side of that line of transportation. The more enterprising, like Coleman, Wilcox, and Habel, penetrated to greater distances, to Fortress Lake and the sources of the Athabasca; but, in general, sport enough was offered in making first ascents of the numerous challenging summits either close by the easily accessible railway hotels or sighted not far away from those first conquered peaks. The story of these explorations furnished numerous articles for alpinistic periodicals—especially for the *Alpine Journal* and *Appalachia*—and increased the output of alpine literature in book form with such volumes as Green's "Among the Selkirk Glaciers," Wilcox's "Camping in the Canadian Rockies" and "The Rockies of Canada," Collie and Stutfield's "Climbing and Exploration in the Canadian Rockies," and Outram's "Heart of the Canadian Rockies," to mention only the chief.

Perhaps it might be said that the pioneer period closed with the year 1906, if it were safe to draw such a distinction in a vast region in which extensive districts still remain unexplored and continue to invite to the same struggle with unconquered Nature that the first comers met, in almost impenetrable forest, intricately crevassed glaciers, sheer precipices, and towering ice-clad pinnacles, last refuge of the affrighted spirit of solitude. Certain it is that the year 1906 marks an epoch, for it was then that another manifestation of the increasing national consciousness of Canadians led to the formation of the Alpine Club of Canada. As a result some seven hun-

FIG. 1—Sketch map of the Canadian Alps. Scale, 1:4,000,000.

The insets show in greater detail the Selkirks (upper right) and the Rocky Mountains (lower left) where they are crossed by the Canadian Pacific Railway.

Note. The altitudes of the following peaks should read thus: Mt. Bryce (52° N. and 117⅔° W.), 11,800 ft.; Mt. Sorcerer (51½° N. and 118° W.), 10,410 ft.; Mt. Assiniboine (51° N. and 115⅔° W.), 11,860 ft.; Mt. Collie (lower left inset), 10,315 ft. The following changes should also be made: "Upper Columbia L." (50¼° N. and 116° W.) to Columbia L.; "Mt. Thomson" (lower left inset) to Mt. Thompson.

dred men and women are today enrolled in its membership, a number nearly a hundredfold greater than could have been recruited among lovers of the sport previous to that date, and to members of that organization are to be accredited several of the best achievements of more recent years.

A glance at the map (Fig. 1) shows this alpine district made up of three parts: (1) the main chain of the Rocky Mountains with its subordinate ranges, all lying east of the great trench of the Columbia in its northerly flow, and (2 and 3) a well marked two-fold system within the vast ox-bow made by that stream through its sudden turn southward at the Great Bend, a district extending southward to the Kootenay. A short canal uniting the upper Kootenay River to Columbia Lake converts this wholly mountain territory into a vast interior island. The two lesser systems within its borders are separated by another longitudinal trench approximately parallel to that of the Columbia. Some confusion in nomenclature has arisen here, which obviously should be ended by a general adoption of the scheme advocated by Professor R. A. Daly,[1] employing the term "Purcell Range" for the mountains eastward of this trench and confining the name "Selkirks" to those that lie west of it, abandoning in favor of "Purcell Range" the term "Southern Selkirks," which has recently been applied in several articles describing ascents in this district.

It is the purpose of this article briefly to present the more recent work of alpinists in the three regions here described: the Canadian Rockies and the Selkirk and Purcell Ranges.

The second number of *Alpina Americana*, the elegantly illustrated publication of the American Alpine Club, issued as recently as 1911, presented a tolerably complete list of the better-known peaks surpassing 10,000 feet in the first-mentioned range, with data concerning their position and first ascents and the literature describing these. In the intervening five years this list has been notably extended. At that time ninety-one peaks were scheduled, of which eleven were noted as "unclimbed." The fact that not one of the unclimbed eleven has meantime been ascended is due to the greater interest attaching to the peaks that have invited to conquest. These lie far to the north of the region traversed by the Canadian Pacific,[2] the majority of them even beyond Yellowhead Pass, so recently entered by the Grand Trunk Pacific and Canadian Northern Railways.

Yet before discussing these remoter explorations mention should be made of the most important recent climbs in the more familiar region. These include the successful ascent of Pinnacle (10,062 ft.) in the Paradise Valley by Hickson in 1909; of the North Tower of Goodsir (11,555 ft.) that same year by Forde; of Douglas (11,220 ft.) and Quadra (10,350 ft.) in 1910, also by Hickson; of Ringrose (10,741 ft.), the lower companion of

[1] The Nomenclature of the North American Cordillera between the 47th and 53rd Parallels of Latitude, *Geogr. Journ.*, Vol. 27, 1906, pp. 586-606.

[2] The air line distance from Mt. Victoria to Mt. Robson is about 200 miles.

Hungabee, and Glacier Peak (10,831 ft.), between Ringrose and Lefroy, by Fynn; the traverse of Assiniboine from its northwest base (reversing Outram's track in the notable first ascent in 1901), accomplished in 1910 by Longstaff of Himalayan fame; that of the nameless (?) pass from the Ice River valley to the Ottertail, made by Richardson in 1909 and described by him with its risky features in an article;[3] also the traverse of the shattered northwest arête of Mt. Victoria by Culver; finally the traverse of the South Tower of Mt. Goodsir (11,676 ft.) made last September by Hickson with Edouard Feuz at the cost of a night at 10,000 feet. The enterprising expedition of Mrs. Schäffer[4] from Laggan to Yellowhead Pass via the exquisite Maligne Lake, to which she was perhaps the first civilized visitor, brought to notice numerous fine peaks, yet unclimbed, to which she gave names. These lie near to the more recently opened alpine district to which we now turn our attention.

It seems but yesterday that even those familiar with Canadian mountains first heard of Mt. Robson. The early trappers and explorers had passed in sight of it. Milton and Cheadle in their "Northwest Passage by Land" (1865) had indeed proclaimed its "supreme grandeur," and James McEvoy in the Report of the Geological Survey of Canada for 1898 had confirmed it, though reducing their estimate of its altitude from a possible 15,000 to 13,700 feet. Then it lapsed from memory in its remote solitude for nearly a decade. In 1907 Professor A. P. Coleman and his brother—who, in 1893, after two previous failures, had succeeded in reaching the base of Mts. Brown and Hooker and proving those widely proclaimed giants of the Cordillera very insignificant peaks after all—, accompanied by the Rev. G. B. Kinney, made the first serious attempt to reach and ascend the great mountain. The long journey, which followed the longitudinal valleys within the ranges, was begun from Laggan on the Canadian Pacific Railway on August 3, but it was September 10 before the party had reached the base of Robson in the valley of the Grand Forks of the Fraser. Six days later they were returning, baffled by bad weather and failure of supplies, after hardly more than a reconnaissance of the lower southwestern slopes from the steep valley of the Little Fork.

The following year the same party made quicker work by starting from Edmonton, and attaining the Yellowhead Pass across one hundred and fifty miles of intervening plains and muskegs. From the valley of the upper Fraser they made their approach by the way of Moose River and Pass to the southeastern base of the great peak, where the main Robson glacier descends to the pass of the same name. Their several attempts to make the summit by this route met with failure at about 10,300 feet, though a later trial proved it feasible. Kinney on the last day of their stay ventured

[3] W. Symmes Richardson: From Noon to Midnight on an Ice Slope, *Alpine Journ.*, Vol. 25, 1910-11, pp. 524-529.

[4] See her "Old Indian Trails of the Canadian Rockies," Putnam, New York, 1911.

FIG. 2 – Mt. Robson with Tumbling Glacier from the north over Berg Lake. (Photo by Byron Harmon.)

FIG. 3—Mt. Robson from the southwest up the valley of the Grand Fork of Fraser River. (Photo by Byron Harmon.)

off alone to tackle the giant by its northwest arête, but with no better result. Assuming great risks, in a two days' effort, the intervening night being passed without shelter high up on the mountain, he merely attained an altitude approximately the same as that already reached. A year later, with two pack horses, this strenuous divine set out by himself from Edmonton on the same quest and fell in on the tedious western journey with a young prospector, Donald Phillips, guiltless of any previous mountaineering. Reaching the northwestern base by the route of the preceding year on July 24 (Kinney had left Edmonton on June 11), it was not until August 13, and after several attempts had proved futile, that, starting from the higher of their two lofty bivouacs (10,500 ft.), they attained what they assumed to be the actual summit. Though later developments have cast serious doubt as to the accuracy of this assumption, their approximate success was the reward of an exceedingly audacious feat of mountaineering.

That same year brought to this region the first party of Englishmen, Messrs. Mumm, Amory, and Hastings, members of the Alpine Club, with Moritz Inderbinnen, the first Swiss guide to visit it. Though learning of Kinney's success on their way in, they kept on for an independent try at the peak by another route. Reaching Robson Pass late in the season, they had opportunity to make only a single attempt by the route of the Coleman party of 1908, in which they merely surpassed its record by a few hundred feet. The trip nevertheless won for this region the complete affection of Mr. Mumm, as that farther south had captivated Dr. Collie twelve years before. In 1910 both these enthusiasts returned with Inderbinnen. Again the proverbially bad Robson weather precluded any ascent of the principal peak, though they ascended what is now known as Mumm Peak (9,740 ft.) and a summit which they estimated "the third highest in the Robson group." Proceeding now down the valley of the Big Smoky they were lured by a fine peak, which they christened "Mt. Bess" (10,468 ft.). The year 1911 found the same party again on the ground, Mt. Bess was climbed, and one of the largest glaciers of the Canadian Rockies discovered and explored. From its high plateau they ascended Mt. Chown, a peak of about the same altitude as Mt. Bess. The perfect day of this ascent gave views of "really big mountains" still farther north, and to the west "beyond the valley of the Fraser the beautiful Cariboo Mountains, mysterious and lonely, waiting for the time when they too would be trodden by the foot of man."

This was the year in which the veteran director of the Alpine Club of Canada, Mr. A. O. Wheeler, known to geographic science for his splendid work as local chief of the Dominion Topographical Survey, came with a strong party, under the auspices of that Club, for a thorough survey of the region and incidentally to arrange for one of its summer camps. Topographically and otherwise the expedition was a great success. The result appears in a beautiful three-color map on the scale of 1:100,000, covering

approximately 800 square miles.[5] Some twenty stations were occupied, ten of these above 9,000 feet, including five virgin summits: Calumet (9,740), Gendarme (9.607), Ptarmigan (9,320), Mowatt (9,293), and Colonel (9,166). Furthermore, simply in the way of mountaineering, B. Harmon and the Austrian guide Konrad Kain made the first ascent of Resplendent (11,173), the second highest of the group, and Kain alone that of Whitehorn (11,001), the actual third in altitude. The camp-site then chosen by their director was occupied for some ten days in early August, 1913, by a party numbering seventy-three. Meantime the Grand Trunk Pacific Railway had completed its line as far as Tête Jaune Cache, seventeen miles beyond the Grand Forks; wherefore the journey from Edmonton, which had required fifteen days for Coleman's party in 1908, was now covered in fewer hours. While all the high peaks just mentioned were revisited, and Lynx Mountain (10.471 ft.) and one or two lesser peaks ascended for the first time, the main feature of the occasion was the complete ascent of Robson by Foster, McCarthy, and Kain, over the glacier route (southeastern arête) previously attempted by Coleman and by Mumm. Two other nearly successful attempts were made by the western and southwestern arêtes.[6] Kain's prophecy of two years before, that the peak might be made in eight hours from the camp at Robson Pass (5,500 ft.) proved far too optimistic. With a start from a bivouac on the glacier 1,400 feet higher than the pass, it required thirteen hours of strenuous labor to reach the summit. Snow conditions rendering their route too perilous for the descent, this was made on the south side, with a night out at 9,000 feet.

One great peak among those that had several times been sighted far to the northwest now began to exert its charm. Mr. S. P. Fay seems first to have been fascinated by it in 1912 and in a biological expedition in 1914 to have passed within a few miles of it, reporting upon it that winter to the American Alpine Club under the tentative name "Mt. Alexander,"[7] as also upon Mt. Ida, a fine pyramidal 10,000-foot peak in its vicinity. Quite ignorant of the existence of his party Miss M. L. Jobe and Miss Springate of the Alpine Club of Canada, with Donald Phillips, of Mt. Robson fame, set out that same season on the same quest, and after an exceedingly difficult journey of six weeks, the last few days "back-packing" their equipment, they reached its eastern base. A first attempt failing early, Miss Jobe with Phillips in a second attempt reached an altitude of about 7,500 feet, when limited time and inadequate equipment compelled a retreat. Nothing daunted, this enterprising explorer with the same escort undertook the

[5] Accompanies *Canadian Alpine Journ.*, Vol. 4, 1912, and "Special Number," 1912; also *Alpine Journ.*, Vol. 26, 1912, and *Annual Rept. Topogr. Surveys Branch for 1911-12*, Dept. of the Interior, Ottawa, 1913.

[6] As Kinney's was by the northwestern arête, it would appear that there are at least four feasible routes to the summit of the great peak.

[7] See *Appalachia*, Vol. 13, No. 3 (June, 1915), pp. 238-257. The Geographic Board of Canada has recently adopted the full name "Mt. Alexander Mackenzie" for this peak and has given to the mountain located in 54°5′ N. and 120° W. the name of "Mt. Cross," in memory of C. R. Cross, Jr., of the American Alpine Club, a member of Mr. Fay's party, who lost his life in France in the ambulance service.

same trip in 1915, and this time Phillips, Tyler, and Doucette of her party reached, upon their second attempt, a point estimated as but two hundred feet from the summit, only to be finally driven back by a snowstorm. In her report Miss Jobe calls the peak "Mt. Kitchi."[8] It is variously estimated from 11,000 to 12,500 feet. Standing like Assiniboine and Robson, isolated among far lower peaks, an overestimate would easily be accounted for. Both Mr. Fay and Miss Jobe report still other fine mountains seen in their expeditions.

In 1913 certain striking peaks immediately south of Yellowhead Pass were located and measured by Wheeler from a station on Yellowhead Mountain. Mt. Geikie (11,016 ft.) on the continental divide was reported upon by him as a "magnificent first climb in store for some enterprising mountaineer and one that would challenge the highest skill and perseverance," and so its fame went forth. Unfortunately that name has been locally applied to another peak visible from the railway at Jasper station. It was this latter "Geikie"[9] which became the goal of Mr. Mumm in 1914, when making his fifth visit to these parts with his faithful Inderbinnen. Almost continuous bad weather foiled his efforts, permitting only minor ascents: one of Mt. Brown, the first since the Coleman expedition reduced its alleged altitude of 16,000 to 9,000 feet, and another summit lower down on the west side of the Whirlpool River. From the latter Mumm was impressed with the numerous fine peaks near at hand, both east and west of the Whirlpool. Last summer another party, this time from the United States, Professor E. W. D. Holway, whose name figures prominently in Selkirk exploration, and Dr. A. J. Gilmour set out for the same goal and on August 5 reached its summit (which appears to rise some 170 feet higher than the true Geikie), over the northwest arête, which they followed to a very steep cornice overhanging the perpendicular north face of the mountain. Several minor peaks at the hitherto unexplored sources of Geikie Creek were also ascended in the twelve days' trip.

With few possible exceptions the foregoing represents the ascents accomplished in this section of the Canadian Rockies.

Turning now to the Selkirks we find a somewhat contrasting condition of things. While it was here that mountaineering as a sport among the Canadian Alps was first begun, and several of the finest peaks—Bonney (in 1888), Sir Donald, Swiss Peak, Fox, Selwyn, Sugarloaf, and Purity (all in 1890)—had been ascended before any first-class summit in the more easterly range had been won, activities, so far as new ascents are concerned, long remained at a standstill. With the exception of Rogers (10,536 ft.), climbed by Abbot, Little, and Thompson in 1896 and Dawson (11,113 ft.),

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8 See *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, No. 7 (July), pp. 481-497, with three-color map, 1:300,000, which may be consulted for details of the region between Yellowhead Pass and Mt. Alexander Mackenzie.

9 The name "Mt. Fitzhugh," applied by Wheeler to this peak, has recently been replaced by Mt. Cavell, to honor the memory of the martyred English nurse.

the second in height of the Selkirks, by Parker and Fay in 1899, not a single first-class virgin peak of this range was ascended during the entire decade following the ascents just cited. An almost equal paucity characterizes the seven following years. Of peaks above 10,000 feet the record shows, in addition to the nearby Mt. Hermit,[10] only Mt. Wheeler (11,023 ft.), occupied in 1902 as a station of the Dominion Topographical Survey and given the name of the enthusiastic mountaineer who was chief of the Survey party, and in 1904 Mt. Sorcerer (10,410 ft.), climbed by H. Peterson, both somewhat remote from Glacier House, one to the south the other to the north.

The reasons for this comparative neglect are obvious. In the Rockies, the alluring peaks stand out in general as noble massifs approachable with pack trains through broad, open valleys, so that the delights of comfortable camping are added to the yet keener pleasure of the ascents. In the Selkirks all this is changed. The more intricate topography is characterized by a complex of deep U-shaped valleys heading at lofty ridges, from which spring the serrated culminating peaks. This prime factor of inacessibility is accentuated by the dense forests with their jungle of undergrowth, irrefutable evidence—if any were needed—of the vastly greater precipitation which aliments the multitudinous glaciers and torrents and aggravates the weather hindrance to high tours. Trail making is most arduous. The use of horses is thus practically eliminated, and "back-packing" is the sole means of transportation. Even though guides may consent to assist and it is possible to secure the services of porters, it is obvious that enthusiasm could be inspired only by the sight of unclimbed peaks of the first magnitude. Such lures, however, exist, and several conquests of unusual difficulty have more recently been accomplished.

In 1908 a new epoch[11] for this region began with successful climbs on the two ranges next south of and beyond the Asulkan Pass. A remarkable *tour de force* was performed in that year by E. Franzelin, an Austrian engineer, who quite alone made the traverse of the three western summits of the Dawson Range (Häsler, Feuz, and Michel), thus accomplishing the first ascent of the two latter.

The preceding year there had appeared upon the scene for their preliminary climbs three gentlemen from the United States, whose names for the next seven years were to have the most prominent place in Selkirk exploration: Mr. Howard Palmer and Professors F. K. Butters and E. W. D. Holway, all of the American Alpine Club. In this, their second season, they made the first ascent of Mt. Cyprian (10,712 ft.) in the Bishops Range (the

[10] The two secondary culminations of Swiss Peak, the highest of which had been climbed by Sulzer in 1890, were traversed by Miss Benham in returning from the second ascent of Mt. Rogers.

[11] For a detailed account of earlier and recent explorations in this region see "Mountaineering and Exploration in the Selkirks" by Howard Palmer, with original maps and profuse illustrations, Putnam, New York, 1914; see also the same author's "Notes on the Exploration and the Geography of the Northern Selkirks, British Columbia," with map, 1:600,000, *Bull. Amer. Geogr. Soc.*, Vol. 44, 1912, pp. 241-256.

one next south of Dawson) and the second of Mt. Wheeler. In 1909, again penetrating beyond the Asulkan and Donkin Passes, they captured the snowy Kilpatrick (10,624 ft.) and Augustine (10,762 ft.), the highest of the Bishops Range, with the ascent of Mt. Dawson by the hitherto untried southern face, and completed their strenuous summer with an exploration of the primeval fastnesses of the Battle Creek valley, the unvisited region south of the third (Purity) range. In 1910, returning to this latter neighborhood, Holway and Palmer accomplished the ascent of Grand Mountain (10,832 ft.). In 1913 the same energetic alpinists with two Swiss guides—sons of the two who in 1899 made on Mt. Dawson their first virgin ascent in America—scaled two fine peaks, Beaver (10,644 ft.) and Duncan (10,548 ft.), at the sources of the Beaver River. Late in the autumn Holway returned alone to this region and climbed Sugarloaf—the third ascent of this peak; and finally in 1915 with Butters and Gilmour made the first ascent of a nameless peak (10,500 ft.) in the Battle Range.

This schedule has been continued through the lustrum, in order to cover the notable climbing in the district south of Glacier House. We must now turn back to tell what meantime was on foot in the mountains north of the Hermit Range. The greatest prize of all, the primate of the Selkirks, rose there in an almost unapproachable solitude. Its majesty had impressed our Anglo-American party in 1897, as we gazed upon it in our traverse of Castor and Pollux. It was the Queen's jubilee year, and for the nonce we christened it "Mt. Victoria"—a name transferred shortly after to the impressive mountain we climbed a few days later from the chalet at Lake Louise. We longed for a try at this grand Selkirk peak, now known as Mt. Sir Sandford, and calculated that it might be approached by the valley of Six Mile Creek, but little suspected the difficulty of the route. This peak, 11,634 ft. in height, lies twenty-seven miles west of north from Mt. Rogers of the Hermit Range, at the headwaters of Gold River, a tributary of the Columbia entering that stream some nineteen miles below Beavermouth, the nearest railway point to the mountain. It has its name from the late Sir Sandford Fleming, former engineer-in-chief of the Canadian Pacific Railway.

The first attempt to reach it was made in 1906 by a party of young men from the University of Pennsylvania with canoes to the highest point attainable on Gold River; it met with speedy failure, the party not reaching the base of the mountain. A second trial in 1907 by members of the same party ended in its preliminary stages in a deplorable accident in the forest and a fatal disaster in the stream. In September of this year P. A. Carson, of the Dominion Topographical Survey, set out with horses by the same route in the hope of occupying Sir Sandford as a station. Obliged to leave their animals at the head of Six Mile Creek, they toiled with their heavy instruments down the steep slopes and over intervening ridges and were glad to substitute as their station Mt. Sonata (9,000 ft.), the mountain next

FIG. 4.

FIG. 5.

FIG. 4—Uto Peak and Sir Donald from Avalanche. (Photo by Howard Palmer.)
The most difficult ascent is by the northwest arête, the knife edge of which descends toward the legend below the cut.

FIG. 5—Eagle Peak, Uto, and Sir Donald from across the Illecillewaet valley. (Photo by Howard Palmer.)

FIG. 6.

Mt. Wheeler Mt. Kilpatrick

FIG. 7.

FIG. 6—Lake McArthur and Mt. Biddle. (Photo by George and Mary Vaux.) Biddle Glacier enters the lake at its upper end.

FIG. 7 Mt. Wheeler and Mt. Kilpatrick from the north. (Photo by Howard Palmer.)

south of but "a very long way from Mt. Sir Sandford." In 1908 two parties were in the field. That of R. T. Shaw of the party of 1906, proceeding by way of Six Mile Creek, succeeded in reaching an altitude of nearly 9,000 feet on the southeast arête of the mountain, only to find it inaccessible. The other was that of Palmer with B. S. Comstock, a frequent visitor to the Selkirks. Choosing the river route, they met with somewhat better success than their predecessors, securing from an eminence on the Sir Sandford range a view of the monarch some four miles distant and a satisfactory solution of the question of its approach. The sight proved an unfailing inspiration to the incipient alpinist, and he was not to desist from his attempts until the prize should be won. The year 1909 brought the same pair, with Professor Herschel C. Parker of Mt. McKinley fame, again into the field. In this trial Palmer and Parker reached an altitude of 9,000 feet on the mountain's western arête. Their exploration discovered at its base what is probably the largest glacier in the Selkirks, and "the splendid group of granite peaks that faces Sir Sandford from across the valley to the northwest was seen in its full grandeur for the first time."

In 1910 the trio that had been so active beyond Donkin Pass came as a unit to this grander field. By the route now so familiar to Palmer they reached the high camp beside the Sir Sandford glacier. The next day proved favorable for an assault by the route selected the previous year. At an altitude of 10,000 ft., a critical point well beyond that reached the previous year, insufficient rope at a steep ice-slope compelled a return to camp. A futile reconnaisance was made of the eastern arête, in which they made the ascent of "The Footstool," a snow dome (10,410 ft.) just under the steep cliffs of the great peak. Nine days later, in another attempt, the ice-slope was again reached, but the condition was hardly improved and the cold was intense. After two hours' labor here it was again necessary to retreat. A fine rock tower, Pioneer Peak (10,660 ft.), was successfully scaled before retiring for the season.

The campaign of the same party in 1911, so far as attaining the summit of Sir Sandford is concerned, was even more disappointing. An especially early start was made and they were at their high camp by the middle of June. On the 18th they made their first attempt, involving a sensational 500-foot traverse of a snow slope of 60°, but the usual conditions defeated them at about the same altitude as before. Then followed three weeks of continuous rains. Fortunately the party had come with another serious object, the careful mapping of this section of the Selkirks, and the tedium of the stay in the inhospitable camp was varied by occupying available stations[12] during the brief intervals of sunshine. Not until July 12 did another opportunity offer to attempt Sir Sandford, when the "atrocious" condition of the snow turned them back at a lower point than that previously reached. During the next ten days conditions not improving for the main

[12] Nine stations at altitudes between 9,300 and 10,960 feet were occupied, all new ascents.

Footstool

Ravelin

FIG. 8.

Mt. Redan

FIG. 9.

FIG. 8—Mt. Sir Sandford from north-northwest (afternoon light). (Photo by Howard Palmer.)

FIG. 9—Selkirk glaciers west to northwest of Mt. Sir Sandford. (Photo by Howard Palmer.)

peak, topographical excursions to remoter points were made over the glaciers and passes. Goldstream Mountain (9,350 ft.) on the western verge of the range was occupied, Moberly Pass, of local historical interest, visited, and Mt. Redan (9,570 ft.) taken in on the return trip. In addition to the topographical results, a splendid first ascent was accomplished on the last day of their stay,—Mt. Austerity (10,960 ft.), one of the forbidding turrets of the Adamant Range.

Abandoning their quest for the present, the party proceeded to Glacier House, whence they made a brief visit to the high peaks at the head of the North Fork of the Illecillewaet, accomplishing the first ascent of Mt. Holway (10,002 ft.) and the third of Mt. Sorcerer (10,410 ft.), both of which they occupied as topographical stations. From them they had in full view to the north the region just visited. Among the nearer fine peaks were Mt. Serenity, or Carnes (10,000 ft.), ascended in 1910 by Mr. Bridgland of the Dominion Topographical Survey, and Mt. Moloch (10,198 ft.), which has been the unsuccessful goal of at least five parties: two in 1912; one (that of Professors Sissons and Holway with two Swiss guides) in 1913; and two in 1915—Dr. J. W. A. Hickson with E. Feuz, Jr. (who all but gained the summit), and a party led by Professor Sissons in his second attempt.

In June, 1912, the hour finally struck for the conquest of Sir Sandford. This time the ascent was to be attempted in the regulation manner for peaks of unusual difficulty. Messrs. Holway and Palmer had come again bringing with them the Swiss guides Feuz, Jr., and Rudolph Aemmer, who had accompanied the Culver party of the year before in its unsuccessful attacks upon the northeastern and southeastern arêtes. Weather conditions were excellent, but a greatly increased quantity of ice upon the peak aroused serious concern. Nevertheless an immediate attempt was made. To about 9,000 feet the route was the familiar one; then an alternative to the left looked more promising than the long snow slope, now mostly glazed with ice, and the repelling ice couloir of preceding trips, though it compelled a slow passage beneath dangerous ice cliffs two hundred feet in height. These negotiated, they were soon level with their previous "highest," and for the greater part of the remaining distance to the summit arête had easy going. But shortly below the summit an obstacle was encountered in a snow-walled re-entrant angle of the crest, which (it is no discredit to the excellent ice craft of the amateurs to assume) could never have been passed without able professional assistance. An hour was consumed in gaining a hundred feet. A few moments more and the goal was reached.

Before bidding farewell to this scene of persistent endeavor the party secured an additional prize in Mt. Adamant (10,980 ft.), a splendid and difficult climb.

Climbing in the Purcell Range is of very recent date, no first-class peak apparently having been climbed previous to 1910. The topography and

general conditions are similar to those in the Selkirks, save that mining interests have resulted in the construction of a few wagon roads and trails, by a happy coincidence in the valleys leading to the bases of the highest peaks. Here, at the midway section of the range, several streams flow from the main watershed east to the Columbia and west to the Duncan River or Howser Lake, tributary to Kootenay Lake. Of the easterly streams four afford approaches to the region recently explored. Named from north to south, these are Bugaboo, Salmon, Horsethief, and Toby creeks. The only known pass available for horses is approached by the last of these—Earl Grey (formerly Wells) Pass—visited by its namesake in pleasure trips in 1908 and 1909. In 1910 Wheeler, accompanied by Longstaff, in an expedition primarily for a survey, undertook to make a passage across the range, entering by Bugaboo Creek, which attempt proved futile. Several minor peaks were occupied as stations, and the results will shortly be published in the Windermere sheet of the Canadian Geological Survey. In that same year Mr. C. D. Ellis, a resident in the Columbia valley, succeeded in reaching the summit of Mt. Nelson (10,772 ft.),[13] the only peak bearing a name other than of very recent origin, it having been so called by David Thompson in 1807. With Ellis was E. W. Harnden of Boston, who was prevented from attaining the summit, but to whom great credit is due, as also to other members of the Appalachian Mountain Club, for topographical work done here and for the stimulating of interest in the region. The only existing detail maps of this region are the sketch maps made by Harnden and his associates in their several visits, which, however, cover only a limited area about the sources of Horsethief and Toby Creeks and their tributaries. They are published in the *Canadian Alpine Journal*[14] and *Appalachia.*[15]

This region would seem to rival with the vicinity of Glacier House in the Selkirks as a center for first-class mountaineering, and it has recently received due attention from several alpinists, who have scored notable successes. In 1911 Harnden and party made with Ellis the second ascent of Nelson and the first of Mt. Catherine (9,900 ft.), Mt. Gleason[16] (10,550 ft.), and of Mt. Monica (10,060 ft.) at the head of the fine Starbird Glacier. In 1913 Harnden and Phelps made a nearly successful attempt on Jumbo Peak (11,125 ft.) at the head of the south fork of Horsethief Creek and accomplished the first ascent of Sir Charles (10,800 ft.) from the same camp.

The year 1914 saw two successful parties in the field, both accompanied by Swiss guides. The MacCarthys, with Kain, made the first ascent of Mt. Farnham (11,075 ft.) and its precipitous outlying Tower (10,850 ft.);

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13 Excepting for Mts, Nelson, Farnham, and Delphine all altitudes quoted for peaks of the Purcell Range are approximate.

14 Vol. 4, 1912, opp. p. 99.

15 Vol. 12, 1909-12, opp. p. 360.

16 Named for H. W. Gleason, a member of the Earl Grey party and later enthusiastic visitor to the region. Of the names here mentioned for peaks in this range, in addition to Nelson and Farnham previously adopted, the Geographic Board of Canada in 1915 approved the following: Coppercrown, Delphine, Earl Grey, and Jumbo.

McCoubrey and P. R. Kerr, with E. Feuz, captured Delphine Peak (10,076 ft.), at the head of the north fork of Toby Creek. In 1914 also Mr. Harnden with two lady climbers[17] made the first ascent of Mt. Bruce (11,250 ft.), the peak hitherto confounded with "Eyebrow Mountain,"[18] so named by Wheeler and Longstaff when seen from the station near Bugaboo Creek. But the very last season furnishes the most notable record. President and Mrs. W. E. Stone of Purdue University, Mr. and Mrs. MacCarthy and H. O. Frind, all enthusiastic alpinists, with Kain as guide, after a preliminary excursion up Salmon Creek, which secured the first ascent of Mt. Ethelbert (10,450 ft.), transferred their camp to the south fork of Horsethief Creek. On August 4 starting to climb Mt. Jumbo, they found themselves on an intermediate peak of the first class (10,950 ft.) which they christened "The Commander." From it they crossed a snowy col and were first to reach the summit of Jumbo. On the following day St. Peter (10,750 ft.) was captured, and on the 6th three summits of the Delphine ridge—Delphine, Spearhead (10,500 ft.), and Peacock (10,525 ft.)—were attained, the two latter virgin peaks. A few days later the MacCarthy's added to this sheaf of conquests a hitherto unclimbed summit which they christened "Birthday Mountain" and "Sally Serena," a fine snow peak on the north side of Horsethief Creek, beside making the second ascent of Mts. Bruce and Monica.

As in the other districts of the Canadian Alps, a large number of fine peaks still await their victors, the most notable of all perhaps being Coppercrown, seemingly peer of the highest, rising in a region a little farther south than that here described.

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[17] M. R. Parsons, of the Sierra Club, and L. Nettleton, of the Mountaineers (Seattle).

[18] This mountain has recently been satisfactorily identified by Harnden as Mt. Farnham, from a photograph furnished by Wheeler.

PHOTOGRAPHIC SURVEYING IN CANADA

By M. P. BRIDGLAND
Dominion Land Surveyor

The accurate survey of broken and lofty mountains is a task as difficult as the geographic results are interesting. The methods employed have varied with available appropriations, the limitations of topographer and instrument, and the character of the relief. The military engineers of a number of European countries, notably Italy and Austria in their Alpine domains, have done admirable pioneer work. Although in practical use for nearly forty years,[1] the photographic method has been brought to a high state of perfection during the last ten or fifteen years.[2] The following account gives an analysis both of the method and of its application to types of relief and climate that have baffled Dominion topographers ever since the survey of the rough lands of the western Cordillera was begun.

In western Canada there are large areas of broken country varying in elevation from low rolling foothills to snow-clad mountain ranges rising ten to eleven thousand feet above sea-level. The mapping of such country offers many difficulties. Ordinary methods of survey are impossible, except for very limited areas, and almost prohibitive owing to excessive cost.

In order to meet these difficulties, the method of photographic surveying was adopted, in the year 1886, by Dr. E. Deville, Surveyor General of Dominion Lands. In that year an extensive survey of the Rocky Mountains along the main line of the Canadian Pacific Railway was inaugurated. Since then the photographic method has been used in many localities.

Photographic surveying may be used in any class of country where the topographic features are sufficiently marked to appear clearly in the

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[1] It may be of interest to note that one of the earliest applications of the method was made by W. Jordan in his survey of the oasis of Dakhel during Rohlfs's expedition to the Libyan Desert in 1873-74, mentioned in the May *Review*, p. 349 and footnote 2.

[2] Recent expositions of the subject are:

E. Deville: Photographic Surveying, Including the Elements of Descriptive Geometry and Perspective. Ottawa, 1895.

J. A. Flemer: Phototopographic Methods and Instruments, *Appendix No. 10* (pp. 619-735), *Rept. Superintendent U. S. Coast and Geodetic Survey for Year ending with June, 1897.* Washington, 1898.

A. Laussedat: Recherches sur les instruments, les méthodes et le dessin topographiques, Vol. 2 (in two parts). Gauthier-Villars, Paris, 1901 and 1903.

S. Finsterwalder: Die Photogrammetrie als Hilfsmittel der Geländeaufnahme, in "Anleitung zu wissenschaftlichen Beobachtungen auf Reisen," edit. by G. von Neumayer. 3rd edit., Jänecke, Hanover, 1906.

S. Finsterwalder: Photogrammetrie, in "Encyklopädie der mathematischen Wissenschaften," Vol. 6, 1, No. 1. Teubner, Leipzig, 1906.

W. Jordan: Handbuch der Vermessungskunde, Vol. 2, Chapter 16. 7th edit., Metzler, Stuttgart, 1908.

F. V. Thompson: Stereo-Photo Surveying, *Geogr. Journ.*, Vol. 31, 1908, pp. 534-551.

H. M. Wilson: Topographic, Trigonometric, and Geodetic Surveying, Chapter 14. 3rd edit., Wiley, New York, 1912.

FIGS. 1 and 2—Two partially overlapping views of rugged topography in Jasper Park in the Canadian Rocky Mountains, taken from two different stations with a camera equipped for photographic surveying. The relation of the two views is shown on Figure 3. Figure 1 is taken from the station marked B, and Figure 2 from the station marked A on that figure. The numerals 1 to 5 represent the same objects in both views and correspond with the points so numbered on Figure 3. The ruled network in the foreground of Figure 2 likewise corresponds with the network of squares in Figure 3.

photographs. The method is, however, best adapted to rugged country, such as the high mountain ranges of British Columbia and western Alberta. Here the season during which climbing may be accomplished with safety is short, and climatic conditions are often unfavorable. High winds, storms, clouds, and extreme cold are the rule, so that work must often be done hurriedly and under great difficulty.

On Canadian photographic surveys the essential instruments are a camera and a small transit. These instruments are of the simplest possible

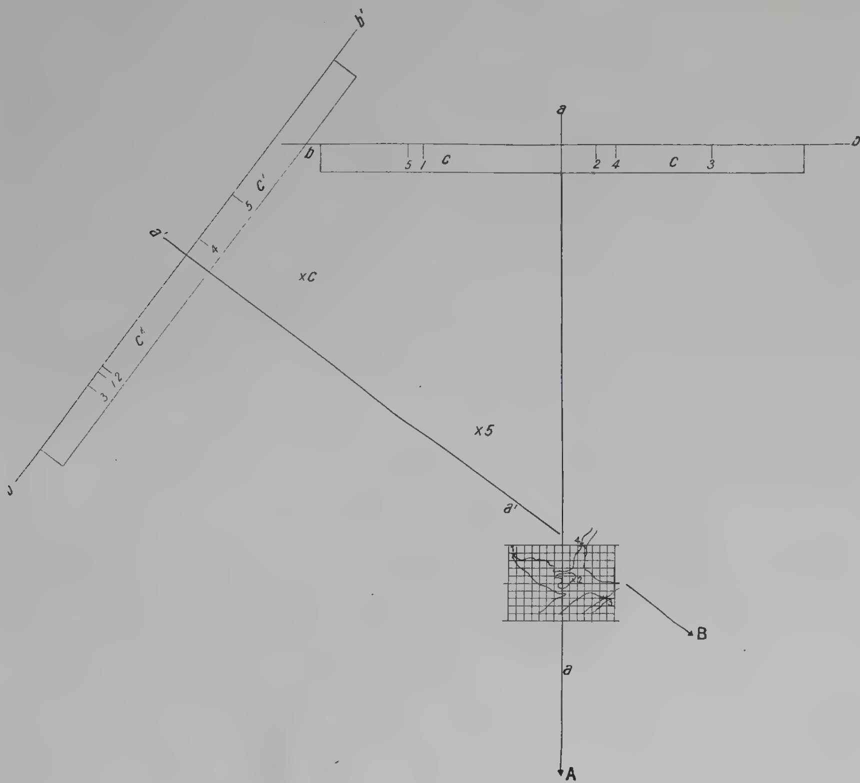

FIG. 3—Diagram to illustrate the method of constructing a map from two photographic views. For explanation, see the text. In practice the distance from *A* to *bb* and from *B* to *b'b'* is made equal to the focal length of the views and the distances of *1*, *2*, *3*, *4*, *5*, etc., from *Aa* and *Ba'* respectively are made equal to the distances of these points from the principal lines of the corresponding views.

form. In this respect they show a marked contrast to the complicated designs of most European instruments.

The camera consists of an oblong metal box, open at one end and fitted into a strong outer wooden case. The metal box carries the lens and two sets of cross-levels which may be read through openings in the outer case. Inside the box there are two sets of diaphragms, and a shade is placed over the lens, when a plate is exposed, in order to eliminate all superfluous light. The instrument stands on a three-screw base, identical with that of the

transit, so that the same tripod may be used for both. The camera may be used with the long side either horizontal or vertical. In the horizontal position the lens has a field of about fifty-one degrees and in the vertical of about thirty-six degrees. The extent of the field is shown by lines ruled on the case. The size of the plates is 4¾ by 6½ inches. The carrying case is made to hold the camera and twelve single plate holders. The total weight of the case with the camera and twelve plates is about twenty pounds.

The transit is a light instrument of the ordinary pattern, made by Troughton and Simms, London, with three-inch horizontal and vertical circles reading to minutes. The tripod has extension legs, three feet four inches long when extended, and twenty inches long when closed. When in use a bag is suspended between the legs and filled with stones, and the legs and bag are further blocked with stones so that it is rigid in any wind. For packing, the head is taken off and placed in the transit box, while the legs are placed in a canvas case designed to hold the box and the legs. The canvas case is fitted with shoulder straps for carrying. The total weight of the instrument complete is about fifteen pounds.

Owing to the excessive contrasts of Alpine scenery, ranging from snow in sunlight to deep and heavily timbered valleys in shadow, it would be impossible to get good photographs with an ordinary camera and lens. Moreover, there is always a certain amount of diffused light which tends to obscure the distant details. The remedy for the former is a plate having great latitude of exposure, and for the latter an orthochromatic plate with a yellow screen. In the last few years the Cramer "Slow Isochromatic" has been the plate principally used on Canadian surveys. The Seed "L. Ortho" has also given good results. In the beginning of the season of 1915, the Canadian cameras were fitted with Tessar lenses and Wratten and Wainwright "G" filters. Along with these, Wratten and Wainwright "Panchromatic Plates" were used and gave satisfactory results.

When in the field, it is important to select those points which give the best views of the surrounding country. This does not mean that the highest peaks are always the best. In photographs taken from a very high peak, the surrounding country often appears dwarfed, and the details do not show up as well as in those taken from a more moderate elevation. It must also be remembered that the higher the peak, the longer the ascent is likely to take, and the greater the likelihood of encountering sudden storms. Frequently very useful views may be obtained with little trouble from points of comparatively low altitude.

It is customary to take enough views from each peak to cover the complete circuit of the horizon. This means very little extra work for the surveyor in the field and the extra views are often of assistance in the office. It seldom happens, however, that all the views can be taken from a single point. Usually one or more camera stations are required on different parts of the peak. As a rule these may be located by reading angles on them

from the central point and measuring the distance with a light tape. Angles must be read on at least one well-defined point in each view, preferably on two. The angle of elevation or depression should also be read on these points as it will serve to check the horizon line of the view if there should be any trouble in the office. It must also be constantly remembered throughout all the field work that all the country to be mapped must be seen from at least two points which subtend angles great enough to give satisfactory intersections and not too great to permit easy recognition of the same points as they appear in corresponding photographs, taken in pairs, one from each station.

For plotting purposes bromide enlargements approximately 10 x 14 inches in size are made from the negatives. To obtain satisfactory results, the enlarging must be very accurately done. This work is done at Ottawa with an enlarging camera made specially for the purpose.

In the office the triangulation is plotted by ordinary methods, depending on the nature of the control. This may vary from a precise triangulation to a reconnaisance survey, where the triangulation and the photography are carried on at the same time. Elevations of the stations and more prominent peaks are computed from the angles read in the field. Where necessary, corrections are made to allow for curvature and refraction.

Views from different stations showing the same country are then selected. Sufficient points are identified on each of two corresponding views taken from the different stations to show clearly the topography of the country. These points are then plotted on the plan and their elevations calculated from the photographs. Using these points as a guide, and with the photographs in front of him, the topographer is able to draw in his contours with an accuracy dependent chiefly on the number of points plotted and on the scale of his plan.

Figures 1 and 2 represent views from two stations shown as *A* and *B* in Figure 3. On these views, points *1* to *5* have been identified to illustrate the method of plotting. The principal and horizon lines, whose positions have been determined during the season, are first ruled on the views. The traces of the principal line and of the picture plane for each view are then laid down on the plan as shown in Figure 3, *aa, bb,* and *a′a′* and *b′b′* representing these traces respectively for Figures 2 and 1. The distances of the identified points from the principal line are then taken off on a slip of paper, a separate slip being used for each view. These slips are then placed on the traces of their respective views as shown by *cc* and *c′c′* in Figure 3. The line of sight to any point is then given by drawing a straight line from the station to the projection of the point as shown on the slip. By inserting needles at *A* and *B* and using fine silk threads or hairs, instead of actually drawing lines on the plan from each station, the intersections may be determined very rapidly.

The elevations of the points are taken out by means of the instrument

shown in Figure 4, which was originally devised by Messrs. D. B. Dowling and H. Matheson of the Canadian Geological Survey. The arms *M* and *N* are of brass fastened rigidly together. *P* and *Q* are sliding bars, moving on the arm *M*. *R* is a swinging arm revolving around the center *O*. *P* and *R* are made of transparent celluloid, and on *R* a fine line *rr* is ruled radiating from the center *O*. The arm *Q* carries a scale corresponding to the scale of the map. The instrument must be made accurately so that, when the line *rr* is over the line *s*, the reading of the scale will be constant when moved along the arm *M*.

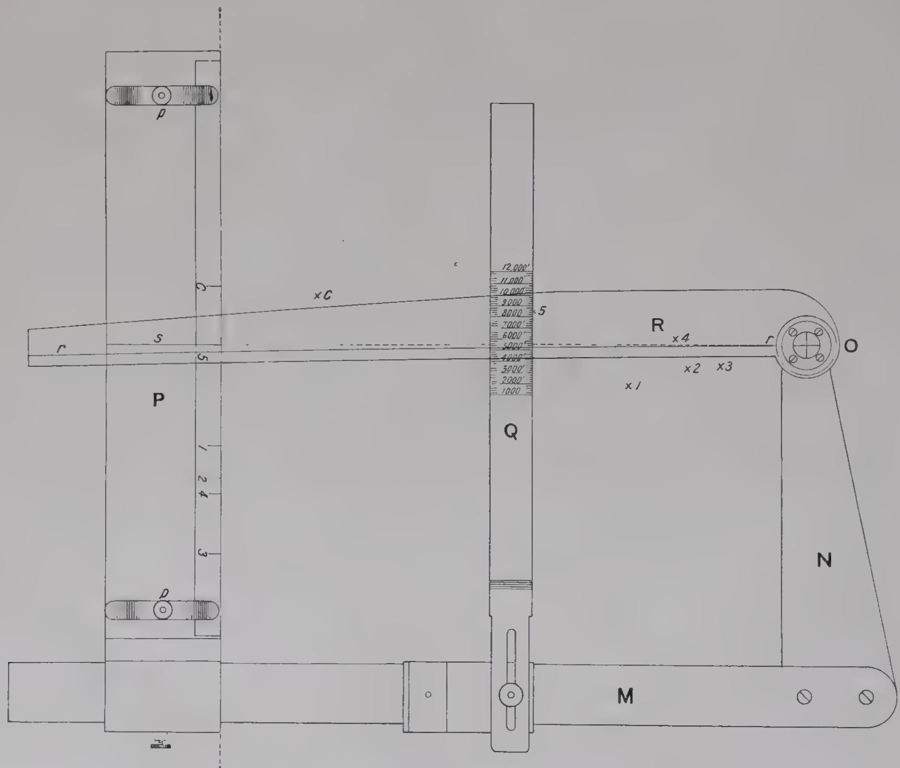

FIG. 4—Instrument devised by Messrs. D. B. Dowling and H. Matheson of the Canadian Geological Survey to determine the elevation of points plotted from photographic views. For explanation, see the text. In practice, the length of *s* from the center of *O* to the fiducial edge of *P* is made equal to the focal length of the views.

When using this instrument the center *O* is placed over the station, and the arm *P* is placed so that the edge coincides with the trace of the view, the line *s* falling on the principal line. The instrument is then held in place by heavy paper-weights. The distances of the points above or below the horizon as shown on the view are taken off on a slip of paper. The slip is then placed on *P*, as shown in the diagram, and held in position by the clips *p p*. The scale is now set to read the elevation of the station when

the line rr is above s. To obtain the elevation of the point 5 the arm Q is moved to the point plotted and R is moved so that rr passes through 5 as shown on the slip. The elevation of the point is now read directly off the scale. To avoid mistakes the elevation of each point is taken from two views and the mean of the two elevations is used.

Relatively level topographic features such as swamps, lakes, and rivers with comparatively small fall are plotted by means of the perspectometer. This consists of the perspective of a series of squares drawn on glass, having the distance line equal to the focal length of the photograph. The projection of the squares is laid down on the plan, the perspectometer is placed in its proper position on the photograph and the outlines drawn in square by square. This method is illustrated in Figures 2 and 3.

The accuracy of a photographic map depends first of all on the precision of the triangulation. After that, it is dependent on the number of camera stations and on the scale of the plan. Any scale or contour interval may be used. These will be determined by the purpose for which the map is required. For general purposes, the writer considers a contour interval of one hundred feet and a scale of 1:40,000 the most convenient for a large plan. The precision is that of a good plane-table survey, but with the advantage that more points are plotted and the contouring is done by the surveyor in the office, with the views from the different stations before him to which he can refer alternately, while with a plane table this simultaneous comparison is entirely wanting.

The most tedious and tiresome part of the work is plotting the points and drawing the contours. The office work requires at least twice as long as the field work. This is not a defect but one of the greatest advantages of the method, for the field work, which is most expensive, requires much less time than when any other method is used.

A party of seven can work to the best advantage under most circumstances. The party consists of the surveyor, his assistant, and five men, two of whom should be expert packers if pack horses are used. With two sets of instruments, the surveyor and assistant surveyor, each accompanied by two men, are free to work in the same or different localities, the cook being left in charge of a main camp at some central point. Except on long or dangerous trips one man is enough to accompany the surveyor when actually climbing. If in a country unusually difficult of access, extra help may be advisable.

As regards the cost of the work, it is impossible to give any accurate estimate. The cost depends, in the first place, on the nature and accessibility of the country and, in the second place, on the class of work required. Much also depends on the season, as more or less time is always lost through smoky, cloudy, or rainy weather. The approximate cost of the writer's survey of the Crowsnest Forest Reserve in the years 1913-14 was $9.50 per square mile. This may be considered a fair average.

The following is a list of the principal photographic surveys made in Canada. The areas given are only approximate, particularly in the case of the earlier surveys.

LIST OF THE PRINCIPAL PHOTOGRAPHIC SURVEYS MADE IN CANADA

LOCALITY	AREA SURVEYED IN SQ. MILES	YEAR	SURVEYOR
Main range of the Rocky Mountains adjacent to Canadian Pacific Railway........	2,500	1886–92	J. J. McArthur
Columbia River valley from Revelstoke to Arrowhead	600	1897	J. J. McArthur
Alberta foothills south of Calgary........	2,000	1896–99	A. O. Wheeler
Crowsnest coal area, near Crowsnest Pass, B. C................................	550	1900	A. O. Wheeler
Selkirk Mountains adjacent to Canadian Pacific Railway, from Beavermouth to Revelstoke	1,100	1901–02	A. O. Wheeler
Rocky Mountains adjacent to Canadian Pacific Railway, from Mt. Castle to Beavermouth........................	2,200	1903–06	A. O. Wheeler M. P. Bridgland
Rocky Mountains, Robson district, north of Yellowhead Pass......................	1,100	1911	A. O. Wheeler
Rocky Mountains, Banff-Windermere road from Vermilion Pass to the junction of the Kootenay and Vermilion Rivers......	500	1913	R. D. McCaw
Crowsnest Forest Reserve, southwestern Alberta............................	1,500	1913–14	M. P. Bridgland
British Columbia—Alberta boundary.......	1,500	1913–15	A. O. Wheeler A. J. Campbell
Okanagan Lake district, British Columbia..	1,000	1914–15	R. D. McCaw
Jasper Park adjacent to Grand Trunk Pacific Railway.......................	800	1915	M. P. Bridgland
British Columbia—Alaska boundary........	5,000	1893–1913	Dr. W. F. King
Southern boundary of British Columbia....	1,200	1903–05	J. J. McArthur
Yukon-Alaska Boundary (141st meridian)..	1,000	1907–13	J. D. Craig
Thirtyone-Mile Lake watershed, Quebec....	200	1913	D. H. Nelles
Reconnaisance surveys by the Geological Survey	9,000	1904–15	

THE BALKAN CAMPAIGN

By DOUGLAS WILSON JOHNSON

The Balkan Barrier

Near the head of the Adriatic there rise several small streams whose waters flow almost due eastward through the Save and Danube Rivers, to empty into the Black Sea. South of this west-to-east river trench, and separated by it from the open plains of Hungary and Rumania, lies the rudely triangular mass of complex mountainous country known as the Balkan Peninsula (Fig. 1). Prior to last October the bulk of this difficult terrane stood as an effective barrier between the Central Empires and their Turkish ally. The northwestern corner of the triangle, comprising Bosnia and Herzegovina, was largely under Austrian control, while in the eastern corner the Turks were effectively resisting all attempts of the Allied armies and navies to dislodge them. But the rest of the territory was either openly hostile to the Teutonic powers, or was maintaining a wavering neutrality which constantly embarrassed communication with the Turks and threatened to become an active menace at any moment. It was to resolve this intolerable situation and to impress the world by a decisive military achievement that the German general staff planned the Balkan campaign of 1915.

The Morava-Maritza Trench

Through the mass of the Balkan mountains rivers have cut two great trenches which constitute the only important lines of communication in the region. One of these passageways or "corridors" runs southeastward from Belgrade on the Danube to Constantinople on the Bosporus and consists in large part of the valleys of the Morava and Maritza Rivers. The other connects Belgrade with the harbor of Saloniki on the Aegean Sea and is formed by the Morava and Vardar valleys. From Belgrade as far as Nish the Morava valley is common to both routes. Although possession of the Morava-Vardar trench incidentally became essential to the Teutonic powers for military and political reasons discussed below, it was primarily for control of the Morava-Maritza depression that the campaign was undertaken.

The full significance of the Morava-Maritza trench can be appreciated only in case we recall the important rôle it has always played in the history of the Nearer East. From all parts of Europe highways of travel converge southeastward toward the points where Occident and Orient touch hands at the Bosporus. Whether coming from the plains of the Po over the Pear Tree Pass, from western and central Europe along the upper Danube, or from farther north through the Moravian and other gaps to the Vienna

FIG. 1—Map showing barriers and trenches of the Balkan Peninsula. Scale, 1:5,600,000.

Abbreviations. (1) In northern Serbia, etc.: Lo, for Losnitza; Ma, for Malyen Ridge; Mi, for Mitrovitza (on the Save); O, for Orsova; Ob, for Obrenovatz; S, for Shabatz; Se, for Semendria; U, for Uzhitze; Va, for Valyevo; Vi, for Vishegrad; Z, for Zaietchar. (2) Along the Morava-Vardar trench; D, for Demir Kapu

gateway, travelers find the mass of the Balkans blocking the path to Constantinople and the East; just as in other days the hosts which invaded Europe from the lands of Asia Minor found in this same barrier an impediment to progress toward the northwest. Under these conditions it was inevitable that a continuous river trench cutting clear through the barrier from the plains of Hungary to the shores of the Bosporus should become a topographic feature of commanding historical importance.

Long before the time of the Romans the Morava-Maritza valley had become a highway for peoples migrating east or west through the mountainous Balkan lands. In a later day one of the principal Roman military roads led from Belgrade through the trench to Constantinople. The great Slavonic flood which issued from the plains of northeastern Europe through the Moravian and Vienna gateways entered the Morava valley and, in the seventh century of our era, was flowing through the trench to surge about the walls of Adrianople. A few centuries more, and the mountain sides were echoing the shouts of the Crusaders who toiled along the same pathway to fight for the Holy Sepulcher. Back through the same defile came those hordes of conquering Turks who pushed the limits of their misrule to the very gates of Vienna. In our day a double line of steel rails has succeeded trail and military road, and the smoke of the Orient Express hangs low in the very valley where, centuries ago, dust clouds were raised by the passing of Roman legions, Crusading knights, or Turkish infantry. Here is the vital link in the great Berlin-to-Bagdad railway route, the channel through which German ambition hopes to reach the Far East, and the path by which the Teutonic powers must send men and munitions to the hard-pressed Turks and bring back food to their own hungry people.

Let us examine for a moment the physical characteristics of the stream-carved trench which has figured so prominently in the past history of southeastern Europe and which again today has focused upon it the eyes of the civilized world. The mouth of the Morava valley is widely open to the plains of Hungary, where the Morava River unites with the Danube some miles east of Belgrade. Southward up the river the valley narrows gradually, and the hills on either side rise to mountainous proportions; but as far up as Nish it is mature, with a flat and sometimes marshy flood-plain over which the river flows in a complicated meandering course, with occasional ox-bow lakes and braided channels. Only at two points, where the river has probably cut through ridges of exceptionally resistant rock, does the valley narrow to a more youthful form and force the better roads to make long detours over the hills. There is usually ample room for a main road on each side of the river, while the railway crosses from one bank to the other in order to connect with the larger towns located on the valley floor. The river is navigable half way up to Nish, and throughout the entire distance the flood-plain soils yield rich harvests of maize and wheat.

From Nish the route leads southeastward up a branch stream called the Nishava, to a low divide within Bulgarian territory. The valley of the Nishava is more youthful than that of the Morava and is so narrow in places that the wagon road twice abandons it for a course across the mountains. The railway is able to follow it throughout, however, and in one place the valley widens to a broad basin on the floor of which lies the important town of Pirot. Here fortresses crowned the adjacent hills to guard against a Bulgar invasion of Servia along this comparatively easy path.

After crossing the divide at Dragoman Pass, about 2,500 feet above sea-level, both road and railway descend to the broad, fertile floor of the Sofia basin. Fortunately this trends northwest-southeast and is thus in line with the general course of the Morava-Maritza trench, although it drains to the northeast through a narrow outlet gorge into the Danube. At the southeastern end of the basin the low Vakarel Pass, but little higher than the Dragoman, is crossed, and road and railway easily reach the much larger basin drained by the Maritza River and its tributaries.

The Maritza takes a direct course toward Constantinople for more than one hundred and fifty miles, then turns abruptly southward to the Mediterranean Sea. At this sudden bend in the river stands the fortified city of Adrianople. Except for a short distance below the city, the Maritza no longer serves as part of the great pathway to Constantinople, but becomes a segment in the natural moat, consisting of the Tundja and lower Maritza valleys, which in the past has repeatedly provided Constantinople with an admirable first line of defense against aggression from the west. Above Adrianople the river is too frequently obstructed with sandbars to be of much use for navigation, but its broad basin carries the road and railway which follow the southern bank of the stream. South of Adrianople the small Ergene River flows to the Maritza from the east, and its valley offers a very gentle grade which the railway ascends till within a few miles of Constantinople.

The Morava-Vardar Trench

Second in importance to the Morava-Maritza corridor is the deep trench which cuts through the Balkans from north to south, connecting Belgrade with Saloniki. The Morava-Vardar depression does not lead to the land bridge uniting Europe with Asia Minor, but it does serve as a most important outlet channel from the plains of Hungary to the Mediterranean Sea, and is one of the shortest routes from Central Europe to the Suez Canal. From southern Germany and the eastern Alps, the foothills of the Carpathians and the Alps of Transylvania, and from all of the great Hungarian basin, the valley routes lead straight to Belgrade, whence the Morava-Vardar valley cleaves a way through the mountains to the open waters beyond.

It is not without reason that the Morava-Vardar trench has been called the key to the history of the Balkan Peninsula. Through it ebbed and flowed the tides of repeated invasions from the dawn of history. Under Roman dominion most of it was occupied by an important military road. Through it the Ostrogoths entered northern Greece in the fifth century, A. D., while names still found on the map of Greece bear witness to the great Slav flood which, two centuries later, flowed through the trench and overwhelmed the Greek peninsula. The story of the Serb race is largely the story of a struggle for control of this vital artery of communication. Austria's ambition to seize for her own uses a channel to the sea which should not open on the enclosed Adriatic has been the mainspring of her reactionary policy in Balkan affairs. Bulgaria, realizing that the nation which dominates the Morava-Vardar depression must ultimately dominate the politics of the peninsula, precipitated the second Balkan war in order to make good by force of arms her claim to a section of the trench; and the same incentive played an important part in determining Bulgaria's alliance with the Teutonic powers in the present conflict. Most of the friction between Greece and the Entente Allies had its inception in the fact that Greece controlled one section of a channel all of which was essential to the existence of Serbia. The Belgrade-Saloniki railway was the main artery of commerce which carried through the trench the life-blood of a nation.

The physical characteristics of the Morava valley as far south as Nish have already been discussed in connection with the Morava-Maritza trench. From Nish southward to Leskovatz road and railway traverse one of the open intermontane basins which frequently occur in the midst of the Balkan ridges; but farther south the stream flows from a youthful gorge which continues up the river for ten or twenty miles before the valley again broadens out to a somewhat more mature form. Just north of Kumanovo lies the divide between the Morava and Vardar drainage, a low, inconspicuous water-parting some 1,500 feet above sea-level, located in the bottom of the continuous, through-going trench, and placing no serious difficulties in the way of railroad construction.

South of Kumanovo the valley broadens into a triangular lowland, near the three corners of which stand Kumanovo, Üsküb, and Veles. The main Vardar River enters the lowland from the west, flowing out again at the south through a narrow, winding valley which carries the railway, but no good wagon road. At Demir Kapu the valley narrows to an almost impassable gorge for a distance of several miles but soon broadens again to a flat-floored valley in which the river follows a braided and occasionally meandering channel to the sea. The lower course of the Vardar lies in a very broad, marshy plain terminating in the delta southwest of Saloniki. The special strategic importance of the triangular lowland near Üsküb and the Demir Kapu gorge will be emphasized later.

While the Morava River is navigable for small boats from the mouth half-way up to Nish, the upper Vardar is too full of rapids and its lower course too full of sand-bars to make river traffic practicable. The strategic value of the Morava-Vardar trench, like that of the Morava-Maritza, lies in the fact that, notwithstanding it occasionally narrows to gorgelike proportions, it gives an unbroken channel-way clear through a rugged mountain barrier.

Peaceable Conquest of the Maritza Valley

The immediate object of the Balkan campaign of 1915 was to secure for Germany complete control of the Morava-Maritza trench and the Orient Railway which runs through it from Belgrade to Constantinople. Roughly speaking, one-third of the trench was in Turkish territory, and therefore already subject to German supervision; one-third was in Bulgaria; and the remaining third in Serbia. German diplomacy set itself the task of inducing Bulgaria to become an ally of the Central Powers, in order that the middle third of the Morava-Maritza trench might pass under German control without a contest and in order, further, that Bulgarian troops might bear the brunt of the fighting necessary to capture the remaining third from Serbian hands.

This was truly an ambitious plan, but certain considerations having a geographic basis made it possible for Germany to crown the program with success, and that with slight cost and incalculable profit to herself. The close of the second Balkan War found Bulgaria not only bitter from the disastrous defeat with which her treachery to her allies had been punished, but suffering serious geographical disadvantages from the illogical boundaries forced upon her. Rumania's appropriation of the Dobrudja brought hostile territory close to Bulgaria's chief seaport of Varna and also menaced the safety of the railway connecting with the port, since this line lies parallel to the new boundary and close to the frontier. The natural outlet for all central Bulgaria is to the Mediterranean by way of the lower Maritza River; but the reconquest of Adrianople by the Turks led to a division of territory which forced Bulgarian goods en route downstream to the Bulgarian port of Dedeagatch to cross through a small section of Turkey. The only other natural channel to the Mediterranean from Bulgarian lands was down the Struma valley to the port of Kavala; but Greece in her turn had insisted on a boundary which should leave the lower course of the river and the port in her hands, thus compelling Bulgarian commerce by this route to pass through Greek territory. Finally, Serbia obtained possession of that section of the Morava-Vardar trench which Bulgaria had coveted, leaving to the latter no part of the key to future power in the Balkans. The opening of the present war thus found Bulgaria with a serious geographical grievance against every one of her neighbors. With coast-lines bordering on two seas, every bit of her com-

merce, save only that with Russia, was forced to pass through hostile lands.

Here was a fertile field for German diplomatic effort, and Bulgaria lent a willing ear to plans which promised immediate redress of past wrongs. Turkey was induced to return to Bulgaria the strip of land west of the lower Maritza, thereby insuring to her a railway connection to her Mediterranean port lying wholly within her own boundaries. As a further reward for direct action against Serbia, Bulgaria should receive the coveted section of the Morava-Vardar trench, the conquest of which would be rendered easy by Teutonic co-operation from the north. It was a bargain in valleys. In return for free use of the upper Maritza valley, and assistance in effecting the conquest of the Morava valley, Bulgaria was to receive a part of the lower Maritza valley and a section of the Vardar valley. German diplomacy won, the geographic bargain was made, and from that moment there remained only the problem of forcibly seizing the Morava-Vardar trench.

Natural Defenses of the Morava-Vardar Trench

While conquest of the Morava valley and its continuation up the tributary Nishava was alone necessary to complete Teutonic possession of the Belgrade-Constantinople railway route, two considerations made a comprehensive campaign against the entire Morava-Vardar trench essential. In the first place, as we have just seen, the Vardar valley had to be secured for political reasons, since its possession by Bulgaria constituted an essential part of the Teuton-Bulgar bargain. But military reasons also required its capture. It constituted the one effective line of communication leading to the Serbian armies defending the northern frontier. To cut it was to deprive those armies of reinforcements, munitions, and other supplies coming from the south. Furthermore, possession of the Morava-Maritza trench would never be secure so long as Serbia and her allies held the Vardar depression, for at any moment they might launch a bolt along this natural groove which would sever the Orient Railway at Nish and thus undo all that had been accomplished through the new alliance with Bulgaria. For the Teuton-Bulgar forces the capture of the combined Morava and Vardar valleys was a single military problem. Let us examine the physiographic features which serve as natural defenses of this important trench.

The Northern Defenses. The Morava valley is widely open to the north and is there bounded on both sides by comparatively low hills. An enemy securing a foothold in the rolling country to the east or west could enter from either of these directions as well as from the north, just as the Orient Railway coming from Belgrade enters the valley from the west, twenty-five miles above its mouth. Hence an effective barrier against attack from the north must cover more than the actual breadth of the northern entrance to the valley. Such a barrier is provided by the natural moat of the Save

and Danube Rivers which protects the entire northern frontier of Serbia; and by the hills south of the moat which, as one progresses southward, rise into a wild, mountainous highland.

The Save is a late-mature river swinging in great meanders across a broad, marshy flood-plain. The extensive swamp-lands on either side of the river are difficult to traverse at any time, while the flood waters which spread over the lowland in spring and autumn often make the barrier quite impassable except at Mitrovitza (not to be confused with the Mitrovitza near the Kosovo Polye referred to farther on). South of Mitrovitza and west of Shabatz the marshy peninsula between the Drina and the Save is called the Matchva and is famous for its inhospitable character. In volume the Save is of sufficient size to constitute an obstacle against invasion, but for purposes of navigation it suffers from its overlong meandering course and from frequent shifting of channels and sand-bars. At no point is the stream fordable, and at Belgrade alone is it crossed by a bridge.

The Danube is a river of imposing volume, in places from one to several miles wide. Its value as a defense against invasion is very great, notwithstanding that the numerous islands which mark its braided course from Belgrade east to the Iron Gate gorge offer some advantages for a crossing. It is unfordable and unbridged. East of the braided section the river exchanges its open valley for a narrow, winding gorge which cuts through a mountainous upland and reaches its most imposing aspect at the Iron Gate near Orsova. The walls of the gorge, sometimes forest-clad, sometimes bare rock, are exceedingly steep; while the mighty volume of water constricted within its narrower channel gives a river which is both swift and deep. To cross such a barrier in the face of enemy fire would severely test the abilities of the best-trained soldiery.

It is not strange that so impressive a natural obstacle as the Save-Danube valley should have served for centuries as a bulwark against invasion of the Balkan Peninsula from the north, nor that it should long have been the physical barrier separating the dominions of the Sultan from Austrian lands. In combination with the difficult hill country to the south, the great natural moat furnished the Serbians with an admirable defensive screen, in attempting to pierce which the Teutonic armies suffered more than one costly defeat.

The Eastern Defenses. Throughout its entire length the Morava-Vardar trench is protected on the east by a complex of mountain ridges representing the western ends of the Balkan and Rhodope masses and the southwestern extremity of the Transylvanian Alps. All of these ranges appear to have reached a mature stage of dissection in which the maximum degree of ruggedness is attained. A maze of steepsided ridges and peaks rise from one to several thousand feet above the bottoms of narrow valleys, while at the north the mountain barrier is reinforced by the gorge of the lower Timok River and a short section of the Danube valley. Much of

this difficult country is forested, and no part of it could be crossed with ease by a hostile army.

There are, nevertheless, certain pathways through the eastern barrier which might be forced by a foe possessing superior numbers. Chief among these is that segment of the great Morava-Maritza trench carved by the Nishava River, which unfortunately rises within Bulgarian territory, and flows directly through the barrier into the Morava-Vardar trench at the critically important junction near Nish. To stop this gap the fortifications of Pirot just inside the Serbian border were constructed. Zaietchar, another fortified town farther north, guards the common entrance to the Tsrna and upper Timok valleys, through which hostile forces might ascend to passes whence the drop into the Morava valley is readily effected. The Vlasina, Kriva, and Bregalnitza Rivers, rising at or near the Serbo-Bulgarian boundary on the crest of the main range and flowing westward to the Morava and the Vardar, give access to the trench at Leskovatz basin, at Kumanovo, and in the Veles-Krivolak region. Finally, the broadly open Strumitza valley, mainly in Bulgarian territory, but heading close to the lower Vardar, affords access to several passes from which it is but a few hours' march to the Vardar trench either above or below the Demir Kapu gorge.

It appears, therefore, that despite the protection afforded by difficult mountainous country east of the Morava-Vardar line, the trench was open to attack at a number of critical points, provided the invading forces were sufficiently large to overwhelm resistance and drive their columns through the narrow valleys. This danger was the more acute because along much of the eastern frontier Bulgarian territory reaches the crest of the mountain barrier and in some places even beyond the crest to the western or Serbian slope. It should be noted, furthermore, that the hostile territory flanks the Morava-Vardar trench throughout practically its entire length, usually lying not more than fifty miles distant, while near Vranye and just north of the Greek border westward protrusions of the Bulgarian frontier reduce the distance to a dozen miles or less. The largest and most vital artery carrying the life-blood of Serbia lay dangerously near the surface, and a single stab of the Bulgarian knife might prove fatal.

The Western Defenses. West of the Morava-Vardar trench the threat of danger was less imminent, and the natural protective screen more effective. Although Bosnia and Herzegovina were in Austrian hands, the people were more or less hostile to their new rulers and favorably disposed toward the Serbs. Montenegro was Serbia's ally, while uncertain Albania was not an important factor in any event. Across the Adriatic lay Italy, another ally of Serbia. Only at the north, then, was there danger of an attack upon the Morava-Vardar line from the west; while farther south succor from friends, rather than attacks from enemies, was to be expected from the direction of the Adriatic.

The broad belt of mountains lying between the Morava-Vardar depression and the Adriatic shore is one of the most imposing topographic barriers in Europe. From the earliest times it has stood as an almost impassable wall cutting off the people of central Serbia from all effective intercourse with the inhabitants of the Italian peninsula. In the Middle Ages, Ragusa and other Slavonic cities on the Adriatic coast, although part of a Serbian province and the home of a flourishing school of Serbian literature, found communication with the interior so difficult and with Italy so easy that they came under Venetian instead of Serbian control. The same mountain wall which so long prevented extension of Serbian power westward to the sea, likewise served for centuries as an effective barrier against the eastward migration of Western European civilization into the dominion of the Turks. To the present day no railroad has crossed the barrier to unite the great valley of central Serbia with the sea.

Included in the mountainous belt are ranges high enough to carry snow caps until the month of August, and the name "Albania" is believed by some to have its origin in the snowy appearance of that wild region. It is said that the "Accursed mountains" of northern Albania and eastern Montenegro include some of the least explored lands of all Europe. Just as the mountains of Wales and the Highlands of Scotland preserve languages and customs which have been driven from the open country of England, so the fastnesses of the Albanian hills have kept alive a difficult language that is older than classical Greek and customs which render the rude inhabitants of the country a picturesque subject for study. The conquering arm of the Turk reduced the Bulgarian inhabitants of open plains to complete subjection within a comparatively short time; but a century and a quarter was required to secure a less firm hold upon the mountainous lands of Serbia, while the inaccessible wilds of Albania and Montenegro were never completely subjected to Turkish power. Montenegro was the last Serbian stronghold to yield to Turkish supremacy and the first to regain complete independence.

The physical characteristics of a belt of country so difficult to traverse deserve a word of further description. In the north the mountains consist of submaturely to maturely dissected folds of the Appalachian type, trending northwest-southeast parallel to the northern Adriatic coast and rising from 5,000 to 8,000 feet above sea-level in the higher ranges. Between the hard rock ridges streams have excavated parallel valleys on the weaker beds, but these subsequent valleys are of little real service to man since they lie at right angles to the natural course of his movements between coast and interior. Farther south the rock structure is more complex, and the mountain ridges produced by erosion accordingly of more complicated pattern. Among the rocks involved in the mountain building, limestone is a conspicuous element, and its soluble nature has imposed a peculiarly forbidding aspect on the topography. Most of the rainfall passes under-

ground through sink-holes and smaller solution cavities and then finds its way through subterranean channels to a few principal rivers, lakes, or the sea. As a consequence much of the mountain country is dry and barren, springs are far apart, and the open water courses difficult of access because deeply entrenched in rock-walled gorges. The "gaunt, naked rocks of the cruel karst country" are not only themselves of little value to mankind but they render inaccessible and therefore comparatively useless many excellent harbors on the east coast of the Adriatic.

Because the limestones are purer and more abundant along the coastal border we find that the karst topography is there best developed. Farther inland the maze of hills is occasionally broken by an intermontane basin, the center of whose broad floor may be covered by marsh land, while throughout its remaining portion the fertile soils derived from impure limestone and other rocks yield good returns to the cultivator. Among the largest of the basins are those in which Monastir and Ipek are located, the Tetovo basin, west of Üsküb, where an important branch of the Vardar River takes its rise, and the famous Kosovo Polye, or Plain of the Blackbirds, southeast of Mitrovitza, where in its last great effort against the advancing Turk the Serbian army suffered defeat in 1389. It is largely to these areas that one must credit such measure of prosperity as is vouchsafed the dwellers of this western mountain barrier; but absence of connecting lowlands makes the basins of small service in expediting travel across the region.

It is true that certain rivers cut through the mountain ranges to reach the sea; but not one of these has carved a valley suitable to serve as a highway between the coast and the central Morava-Vardar trench. For the most part the cross valleys are narrow and deep and bounded by the steep, rocky walls characteristic of young gorges cut in limestone. Falls and rapids are frequent, and the headwaters usually end in a maze of ridges some distance west of the central depression. The valley of the Narenta carries a narrow-gage railway through the mountains of Bosnia and Herzegovina to a pass, across which Sarayevo and the valley of the Save are accessible; but the only branch line running east to the Serbian border terminates in the vicinity of Vishegrad, while the nearest railway terminus of the Serbian system is more than twenty miles across the mountains at Uzhitze at the head of the Western Morava valley. Through the gorge of the middle Narenta the course of the railway is difficult, and the crossing of the pass is made possible only by using a rack-and-pinion arrangement, which indicates the unsatisfactory character of the route for commercial purposes. The next river of importance to the south is the Drin, which reaches the sea near Scutari; but it flows in a gorge so wild and deep that the poor trails of the district often leave it for a course across the barren hills. When a column of Serbian troops successfully negotiated this defile during the first Balkan war, the feat was hailed as a great military accom-

plishment. The Shkumbi valley offers an entrance from Durazzo to the rail-end at Monastir, but traffic by this route must cross three mountain passes. A famous Roman road, the Via Egnatia, followed this valley; and the only other two important roads to cross the barrier in Roman times had their locations determined by the Narenta and the Drin, although in each case the stream gorge was abandoned in places for a more feasible course over the uplands. Of these former roads little remains today except rugged mule paths. From the standpoint of military geography the broad mountain belt west of the Morava-Vardar trench is practically impassable.

There are within this western mountain belt three depressions which have relatively little value as parts of cross-routes to the sea, but which we must keep in mind if we are fully to understand certain aspects of the campaign against Serbia. First among these is the open Kolubara valley, at the head of which stands the town of Valyevo. A small railway of some military value traverses the valley and connects the town with the Save River. Directly south across the Malyen Ridge, the Western Morava valley heads near Uzhitze and runs east to join the main trench. The Western Morava River is a mature stream meandering on a flat flood-plain of considerable breadth and is bordered by a narrow-gage railway connecting Uzhitze with the Orient Express line. Finally, the Kosovo Polye, already mentioned, forms part of a subsidiary trench parallel to the main Morava depression. Northwestward the basin is replaced by the long, narrow, winding gorge of the Ibar River, which unites with the Western Morava, but which is not followed throughout its length by so much as a good wagon road. To the southeast the basin is drained by the Lepenatz River, which flows through a narrow outlet gorge at Katchanik, the so-called Katchanik Pass, to unite with the Vardar at Üsküb. An important railway leaves the Nish-Saloniki line at Üsküb and runs through the Katchanik gorge and Kosovo Polye to Mitrovitza on the Ibar.

Our examination of the surface features of the region under discussion has developed the fact that the Morava-Vardar trench is well protected against invasion, whether from the north, the east, or the west; but it appears that the most effective protective barrier is on the west, where it is least required and where, indeed, it might shut off much-needed succor from Italy in a time of peril. Let us now trace the history of the campaign against Serbia in the light of our knowledge of the topography.

The Campaign for Possession of the Morava-Vardar Trench

Austria's first attacks against the northern barrier formed by the Save-Danube moat and the rising hills to the south were ostensibly made primarily for the purpose of punishing Serbia, while the idea of securing any considerable portion of the Morava-Vardar trench was apparently secondary. The first blow in the world war was struck in the last days of July, 1914, when Austria launched a strong offensive along the entire Save-

Danube line. The Serbians destroyed the great bridge over the Save at Belgrade in order to make the barrier more secure and assailed with vigor every enemy column which endeavored to cross the river by boats or pontoon bridges. For nearly two weeks the Austrians made repeated attempts at seven different points to reach the south bank and at the same time attacked the line of the Drina near Losnitza and Vishegrad. At Belgrade a crossing in the shelter of the ruined bridge was only temporarily successful. Farther east, at Semendria, an island served as the base for crossing on a pontoon bridge where the channel narrowed to 200 yards; but the invaders were first held in check, then thrown back in defeat. All attempts to cross at Obrenovatz, southwest of Belgrade, failed. Far to the west Austrian troops succeeded in forcing a passage at Mitrovitza and for some days held their ground in the marshes on the south side of the stream; while the Drina was crossed at Vishegrad. Even here the success seems to have been partial and temporary, for Vishegrad was retaken by the Serbs August 7th, and on the 10th the Serbian government reported the expulsion of the last Austrian from Serb territory. The first attempt to force the northern barrier had ended in failure.

A second attempt was made immediately. After a furious bombardment of the Save-Danube line superior Austrian forces crossed the Save at Shabatz and the Drina at Losnitza, while columns attempting to cross at Belgrade were defeated. In the gorge of the Iron Gate at Orsova, where the swift current and steep walls made the attempt peculiarly hazardous, it is said that three Austrian regiments were destroyed while trying to cross by a pontoon bridge. Renewed attempts to cross at Belgrade and Semendria were frustrated. Belgrade stands on the point of a peninsula projecting into Hungarian territory and is subject to attack from three sides. It was the capital of Serbia, and its capture was urgently desired for political as well as strategic reasons. That this important outpost at the very door of the enemy's country, attacked by superior numbers and bombarded by superior artillery, should have resisted capture for four months, is a striking proof of the strategic importance of such barriers as the Save and Danube Rivers. Meanwhile, on August 20th the Austrian armies which had entered northwestern Serbia were overwhelmed with defeat after a four days' battle in the foothills east of Losnitza and in the marshes of the Matchva near Shabatz and were driven back across the Drina with heavy losses. Fleeing remnants of the invading force overcrowded the few bridges spanning the unfordable stream and large numbers perished by drowning. A second attack against the natural defenses of northern Serbia had proven futile.

About the end of the first week in November, 1914, Austro-Hungarian forces more than 300,000 strong launched a third attempt to force the northern barrier. The open valley of the lower Drina and the marshy Save River were crossed by superior forces with the aid of heavy artillery.

FIG. 2.

FIG. 3.

FIG. 2—A portion of the Austrian army halted on the northern side of the Save River barrier. Temporary military bridges are seen in the distance. (Photo copyright by Underwood & Underwood.)

FIG. 3—German troops moving southward through the narrow gorge of the Ibar River. (Photo copyright by Paul Thompson.)

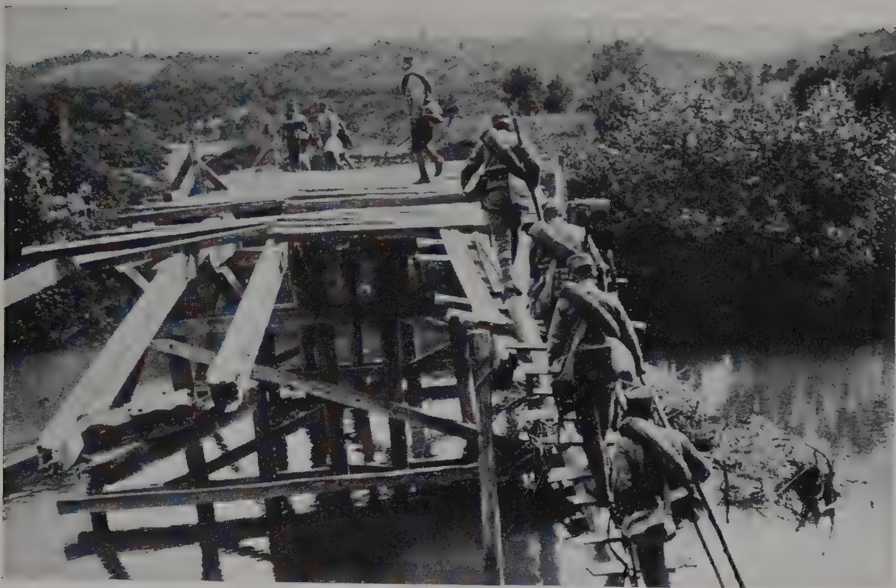

FIG. 4.

FIG. 5.

FIG. 4—Serbian troops crossing the Kolubara River barrier. The bridge was repeatedly destroyed and repaired during the fighting along this stream. (Photo copyright by *L'Illustration* from Underwood & Underwood.)

FIG. 5—A Serbian convoy retreating through one of the two narrows of the Morava valley north of Nish. (Photo copyright by *L'Illustration* from Underwood & Underwood.)

Advancing up the Kolubara valley and the low foothills on either side as far as Valyevo the Austrian center prepared to attack the Serbian position on Malyen Ridge, while the left wing occupied Belgrade, and the right wing captured Uzhitze. Apparently the plan of campaign was for the Austrian center and right wing to converge upon the head of the Western Morava valley and then follow down that depression into the main Morava-Vardar trench, thus outflanking the forces defending its northern end. Meanwhile the small Serbian army was giving a good account of itself, defending river and marsh and hill slope with such effect that not until the first of December did the Austrian forces reach the Uzhitze-Valyevo-Belgrade line. A month of desperate fighting with heavy losses had elapsed before the invaders were ready to attack the main Serbian defensive position on Malyen Ridge just south of Valyevo.

Then came the stroke which startled the world. Assuming the offensive and sweeping down the slopes of the Malyen, the Serbian veterans overwhelmed the whole Austrian army with disaster. Valyevo was recaptured, Belgrade and Uzhitze cleared of the enemy, and all northwestern Serbia swept clean, except the marshy peninsula between Shabatz and the Drina, where Austrian troops maintained a foothold with the aid of topography especially favorable for defense. The upper Drina was crossed by the victorious Serbs, and Sarayevo seriously threatened. A badly beaten Austrian army retired to Austrian soil, to have its commander officially disgraced for the crime of failure. Whether because of difficulty in bringing adequate supplies across the marshy Save and over the foothills to the Austrian front, or because the Austrian forces had been unduly weakened in their month's campaign against the Serb defenses, or because the difficulties of the Malyen position were underestimated and troops were detached to serve elsewhere, a third attempt to force the natural protective barriers of northern Serbia had ended in a costly defeat for the Teutons.

It was now evident that Austria, with many of her troops engaged on other fronts, could not assemble forces competent to dislodge the Serbians from their favorable defensive position. At the same time the need of controlling the Morava-Vardar trench was increasing. The Central Powers were besieged by the Allies, and an outlet to neutral lands and to the sea was a pressing necessity. The Turks needed munitions and the Central Powers needed food. A successful campaign was also required to wipe out the disgrace of past defeats at Serbian hands and to impress wavering neutrals with Teutonic military prowess. Hence was initiated the diplomatic campaign already described, which culminated in the peaceable conquest of the Maritza valley and the accession of Bulgarian troops to the ranks of the Central Powers. Conditions were now ripe for a combined Teuton-Bulgar campaign designed to conquer the entire Morava-Vardar trench.

Early October, 1915, found some 200,000 Germans and Austrians massed

on the Save-Danube line, while a larger number of Bulgars were concentrating in the mountains along the eastern border. The main Serbian army stood behind the northern defensive line to meet the Austro-German attack, smaller forces alone being detailed for operations on the east. A Bulgarian offensive was to be met by the Greek army acting in concert with an Anglo-French expeditionary force. At the last moment the whole scheme of Serbian defense was shattered by King Constantine, who repudiated Greece's treaty with Serbia and refused the promised support of his army. The entire length of the Morava-Vardar trench was thus thrown open to flank attacks from the east while the main Serb armies were trying to protect the northern entrance.

On October 6th the Austro-German assault was launched. Heavy artillery fire which the Serbians could not match protected the columns attempting to force a passage across the river barrier. Nevertheless, the crossing was a costly undertaking; many of the invaders were driven back to the north bank or caught on the south side and annihilated, before large forces after two or three days' hard fighting securely established themselves on the southern bank. It is interesting to note that the principal crossings were effected above Belgrade, below Belgrade, at Semendria, Ram, and Gradishte,—all five of them points close to the northern entrance of the Morava valley, all of them except the last located at the ends of Hungarian railways capable of bringing supplies directly to the points of crossing, and all of them near sand-bar islands in the river which were utilized to good advantage in several and possibly in all cases. There also was heavy cannonading at Orsova, the only other rail-head on the Danube frontier; but no crossing of the difficult gorge near the Iron Gate seems to have been made until later, possibly after threat of envelopment caused withdrawal of the main body of defenders from the northeast corner of Serbia. When the crossing was effected it was with the aid of an island in the river below the town.

After the Danube barrier had been forced, the southward progress of the Teutonic armies was remarkably slow. For six weeks the average rate of advance was about one mile a day. Despite their enormous superiority in big guns, it cost the Austro-Germans much time and the loss of many men to drive the Serbs from successive defensive positions in the hills. More than two weeks elapsed before the Danube was freed from the Serbian menace and so rendered available for boat transport of munitions to Bulgaria and Turkey. Austrian forces crossing the Drina near Vishegrad, the only rail-end on the northwestern frontier, found themselves unable to dislodge the Serbs from their mountain fastnesses, and after ten days' fighting had made no progress toward the head of the Western Morava valley.

Meanwhile Bulgarian armies poured through gaps in the eastern mountain barrier and descended tributary valleys to the Morava-Vardar trench. One

column descended the Vlasina valley to the Leskovatz basin, another reached Kumanovo and Üsküb by the Kriva depression, while a third descended the Bregalnitza to Veles. Vranye, Kumanovo, Üsküb, and Veles, defended by inadequate Serbian forces, were captured within less than two weeks, and the vital artery of Serbia cut in four places. Few could doubt but that these wounds would prove fatal.

Farther north one Bulgarian army was attacking the fortifications of Pirot in order to open a way down the Nishava valley to Nish, while other forces had captured Zaietchar and were trying to push up the Tsrna and the upper Timok to reach the Morava trench above and below Nish. Progress in this field was much slower than farther south, however, and the Serbs maintained themselves in the mountainous northeast corner of their country until the fall of Pirot and Nish developed the danger that Bulgarians pushing north down the Morava and Austro-Germans advancing up the valley to meet them might close the neck of the salient northeast of the trench and capture the forces fighting there. Under pressure of this threat the Serbs withdrew to the southwest; and about November 13, or more than a month after the campaign opened, the entire Morava-Maritza trench was in the hands of the Central Powers, and the reconstruction of the Orient Railway could be prosecuted. The Morava-Vardar trench as far south as Veles was also in their control, and there remained only the problem of rendering the tenure of both trenches secure by pushing the Serbian and Franco-British forces west to the Adriatic and south to the Aegean.

The disastrous results of the Bulgarian occupation of the Morava-Vardar trench now began to be more manifest. Munitions and other supplies for the Serbian armies in the north were becoming exhausted, and the one artery along which they could flow freely had been severed. The quantities which could reach the Serbian front over rough mountain trails were utterly inadequate. Reinforcements were sadly needed; but the one railway leading north from the Anglo-French base at Saloniki followed the Morava-Vardar trench, and so was in the hands of the enemy, while the rough mule paths over the western mountain barrier could bring neither troops nor supplies from Italy. Had the broad belt of mountain and karst intervened between the Morava-Vardar trench and the Bulgarian frontier, and had the more open valleys of the east but led westward to the Adriatic, the history of the Balkan campaign would have been very different.

It was supposed that when the Austro-German forces reached the higher mountainous region bordering the Western Morava valley and it became difficult if not impossible to bring up their heavy guns, the rate of advance would become even slower than before. The fact that the advance was actually accelerated has been interpreted to mean that the failure of Serbian supplies weakened the defense more than the unfavorable local topography injured the plans of the offensive. The Teutons moved rapidly across

the Western Morava, and the Serbian army took up a position running eastward along the mountain crests south of the valley, then southward along the ridge west of the Morava-Vardar trench, and southwestward across the Katchanik gorge. It will immediately appear that the Katchanik position was the strategic key to this entire battle front. In the rear of the Serbian armies facing north and east, runs the straight subsidiary trench formed by the Lepenatz valley, Kosovo Polye, and the Ibar valley. The gateway to this trench is the narrow Katchanik gorge. A railway from Üsküb runs through the gorge to Mitrovitza at the north end of the Kosovo Polye, thereby more than doubling the strategic value of the depression. If the Bulgarian forces already in possession of Üsküb should succeed in breaking through the Katchanik gorge into the plain of Kosovo, they could strike north and east against the rear of the Serbian armies and convert retreat into disaster. Little wonder, then, that the "Katchanik Pass" figured so prominently in the war despatches during this period!

But if Katchanik was the key to the Serbian position, Veles was the key to Katchanik. Should the Anglo-French troops coming up the Vardar from Saloniki capture Veles and debouch into the triangular lowland to the north, they would take in the rear the Bulgarian army trying to break through the Katchanik position. It would not be necessary for the Anglo-French force to enter the Lepenatz valley; the mere threat of enclosing the Bulgarians in the valley between the Serbs up at Katchanik and their allies down at the valley mouth would be sufficient to bring the Bulgars out of the trap in order to fight on the lowland, where, if defeated, they could retire northeastward into a region fully under their control. The threat would become imminent the moment Veles fell to the Allies. Such were the topographic relations responsible for the rather striking fact that an Anglo-French attack upon Veles relieved the pressure upon Serbian forces in the mountains far to the north.

The strategic value of Veles was fully appreciated by the Bulgarian commanders, and heavy reinforcements were evidently poured into the Vardar trench at that point. All efforts of the Allied armies failed to achieve their purpose; Veles remained in Bulgarian hands and Bulgarian attacks on the poorly equipped Serbs defending Katchanik gorge proceeded without serious interruption. When it became apparent that the Katchanik position could not long be held, the Serbian armies at the north and east fell back toward the Ipek basin, while those farther south retired on the Monastir basin. All danger to the Teutonic occupation of the Morava-Vardar trench north of Veles was thus removed, and the remainder of the campaign consisted in squeezing the remnants of the shattered Serb forces and their Montenegrin allies westward through Albania and southward through Montenegro to the sea; and in driving the Anglo-French army and the Serbs near Monastir back upon the Saloniki defenses. The first of these movements progressed with exceeding slowness because of the

difficult character of the country; and the terrors of the Serbian retreat over rugged mule paths and through wild mountain gorges in the cold and snow of winter can scarcely be imagined. But from the standpoint of strategic geography the second movement alone merits special consideration.

When the French and English pushed up the Vardar valley toward Veles they seized as their base for a great armed camp the triangle of mountainous ground lying between the Vardar River and one of its tributaries known as the Tsrna, the latter a stream which must not be confused with the river of same name emptying into the Trinok in northeastern Serbia. The position had certain topographic advantages which enabled it to be held for a long time in the face of superior forces; but suffered from one serious disadvantage which ultimately compelled its evacuation. Both the mountain ridges and the river trenches afforded admirable natural defenses. The gorge of the Tsrna is steepsided and the stream unfordable. The only practicable bridge, a few miles above the river's mouth, was destroyed by the French after they had failed in an effort to move westward and join the Serbs, who were fighting at Babuna Pass to prevent the Bulgars from getting into Monastir basin. For defensive purposes the larger Vardar River, protecting the east side of the triangle, was strategically important, because it is both wide and unfordable and its valley is steepsided,—in one place a veritable gorge.

But it is in the Vardar valley that the chief disadvantages of the situation become apparent. All munitions and other supplies, as well as all reinforcements for the armed camp, had to come from Saloniki over the single-track railway running up the Vardar trench. The railway lies close to the river all the way and for several miles is actually on its eastern bank, or outside the triangle. Its position was thus dangerously vulnerable, and its vulnerability was peculiarly aggravated by the fact that in the Demir Kapu gorge, the Iron Gate of the Vardar, the line is squeezed in between the base of high cliffs and the swiftly flowing river, crosses the river on a bridge at one point, and passes through a tunnel at another. If the Bulgarians, attacking the sides of the triangle, should destroy bridge, tunnel, or narrow road-bed in the gorge, the forces within the triangle would be caught in a trap. Hence it was that when the dispersal of the Serb armies to the northwest had so far progressed as to free additional Austro-German and Bulgarian troops for action against the Allied armies at the south, the evacuation of the triangle was considered imperative.

It has been estimated that at this time the forces of the Central Powers in the south probably outnumbered those of the Allies in the proportion of three to one, or even four to one. That the triangle should have been held so long in the face of greatly superior numbers bears eloquent testimony to the strength of the natural topographic barriers formed by the Tsrna and Vardar Rivers, as well as to the efficiency of the French who mainly were responsible for its defense. The British line now ran eastward from near

the Demir Kapu gorge, along the ridge north of Lake Doiran and south of the Strumitza valley and, like the French triangle, was supplied by one single-track railway. The Serbian front in the Monastir basin ran from west to east just north of the town and connected with the French along the Tsrna River side of the triangle. It also was dependent for supplies upon a single railway line. The French triangle was thus a prominent salient projecting far beyond the general Allied front; it possessed a vulnerable point, the Demir Kapu gorge, on the east side of the salient; and it was the center of a line the two wings of which were less effectively protected by natural barriers and all of which was inadequately supplied with lines of communication.

Early in December the withdrawal from this dangerous situation began. The French retired from the triangle and blocked the gorge against pursuit by blowing up the tunnel and bridge. The British were forced back toward the southwest by a series of furious Bulgarian assaults, and the Serbs were compelled to withdraw southward into Greek territory. The retirement was completed when the Allied armies took up their position behind the natural defenses of Saloniki. The character of these defenses and their influence on the further history of the war will claim our attention at a later time.

WEATHER AS A BUSINESS RISK IN FARMING[1]

By WILLIAM GARDNER REED and HOWARD R. TOLLEY
U. S. Department of Agriculture

No type of agriculture can be successfully established in a region where the risk of loss by drought, frost, or other unfavorable conditions is not more than balanced by the profits at other times. If the farmer is to succeed as a business man, he should know the degree of risk involved in raising a given crop at a given time. Among the business risks of farming those that grow out of unfavorable weather conditions are of chief importance. The result is that there are a growing number of maps which show in detail distributions of meteorological phenomena of all sorts. This investigation and the maps accompanying it attempt to combine the facts hitherto known in a manner that shows the risk of loss from unfavorable weather.

Climatic data expressed in averages afford a basis for determining the general character of a region but give no indication of the frequency or magnitude of departures from the average. Averages are a convenient method of stating the points about which the actual conditions fluctuate, but otherwise they are of minor importance to the farmer.[2] For example, the average date of last killing frost in spring at La Crosse, Wisconsin, is April 26. An examination of the frost record for La Crosse, Table I, shows that the last frost occurred before the average date in twenty-two of the forty-two years of record, and after the average date in twenty years. In other words a crop in a condition to be damaged on April 26 would be destroyed about half the time, that is, the risk of damage by frost on that date is approximately fifty per cent,[3] or more than most crops can bear.

One method of meeting this difficulty has been the statement of the latest recorded date of spring frost at each station; but such data are of doubtful value in the determination of the risk from frost damage, as they rest upon single occurrences and, moreover, represent different things in different places on account of the varying length of the records. On the assumption that the period covered by the record represents conditions

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[1] Substance of a paper presented at the Washington meeting of the Association of American Geographers, December 30-31, 1915, and January 1, 1916.

The writers wish to record their obligation to Prof. W. J. Spillman, Chief of the Office of Farm Management, U. S. Department of Agriculture, for the original suggestion of this method for determining risk and for advice and assistance at all stages of the study.

[2] For a discussion of the meaning of average values in meteorology see H. Meyer: Anleitung zur Bearbeitung meteorologischer Beobachtungen für die Klimatologie, Berlin, 1891, pp. 19-27.

[3] This percentage of risk is true only in the case of phenomena for which the mean and the median have essentially the same value. Such is the case with the dates of last spring and first autumn frost and probably with some temperature phenomena. It is not the case with rainfall amounts, although it may be with the occurrence of rainfalls of certain fractions of the average amount.

TABLE I—FROST DATA

LaCrosse, LaCrosse County, Wisconsin

Latitude 43°49′ N.; Longitude 91°15′ W.; Altitude 681 feet

LAST KILLING FROST IN SPRING				FIRST KILLING FROST IN AUTUMN			
YEAR	DATE	DEPARTURE FROM AVERAGE DATE		YEAR	DATE	DEPARTURE FROM AVERAGE DATE	
		DAYS	SQUARE			DAYS	SQUARE
1906	April 2	−24	576	1889	Sept. 21	−21	441
1901	April 3	−23	529	1893	Sept. 24	−18	324
1903	April 4	−22	484	1888	Sept. 29	−13	169
1886	April 7	−19	361	1908	Sept. 29	−13	169
1898	April 7	−19	361	1873	Sept. 30	−12	144
1902	April 7	−19	361	1883	Oct. 1	−11	121
1900	April 9	−17	289	1886	Oct. 1	−11	121
1896	April 10	−16	256	1899	Oct. 3	−9	81
1899	April 10	−16	256	1901	Oct. 4	−8	64
1894	April 11	−15	225	1876	Oct. 5	−7	49
1882	April 16	−10	100	1881	Oct. 5	−7	49
1877	April 18	−8	64	1885	Oct. 5	−7	49
1905	April 18	−8	64	1887	Oct. 5	−7	49
1912	April 19	−7	49	1877	Oct. 6	−6	36
1914	April 20	−6	36	1904	Oct. 6	−6	36
1884	April 21	−5	25	1896	Oct. 7	−5	25
1897	April 21	−5	25	1895	Oct. 8	−4	16
1904	April 21	−5	25	1907	Oct. 8	−4	16
1893	April 23	−3	9	1891	Oct. 9	−3	9
1875	April 24	−2	4	1894	Oct. 9	−3	9
1887	April 24	−2	4	1897	Oct. 9	−3	9
1874	April 25	−1	1	1906	Oct. 10	−2	4
1913	April 27	+1	1	1880	Oct. 12	0	0
1892	April 29	+3	9	1874	Oct. 13	+1	1
1873	April 30	+4	16	1902	Oct. 14	+2	4
1878	May 1	+5	25	1909	Oct. 14	+2	4
1876	May 2	+6	36	1898	Oct. 15	+3	9
1908	May 3	+7	49	1875	Oct. 16	+4	16
1907	May 4	+8	64	1913	Oct. 18	+6	36
1911	May 4	+8	64	1878	Oct. 19	+7	49
1891	May 5	+9	81	1882	Oct. 19	+7	49
1880	May 6	+10	100	1892	Oct. 19	+7	49
1890	May 7	+11	121	1890	Oct. 21	+9	81
1909	May 10	+14	196	1905	Oct. 21	+9	81
1885	May 11	+15	225	1884	Oct. 22	+10	100
1879	May 13	+17	289	1910	Oct. 22	+10	100
1888	May 13	+17	289	1912	Oct. 23	+11	121
1895	May 14	+18	324	1879	Oct. 24	+12	144
1881	May 21	+25	625	1903	Oct. 24	+12	144
1883	May 21	+25	625	1911	Oct. 24	+12	144
1889	May 22	+26	676	1914	Oct. 27	+15	225
1910	May 24	+28	784	1900	Nov. 7	+26	676

Average date April 26

Standard deviation $=\sqrt{\frac{8703}{42}} = 14.4$

Risk of frost falls to 25% May 6

Frosts occurred after May 6 in 10 years of the 42

Risk falls to 10% May 15

Frosts occurred after May 15 in 4 years of the 42

Average date Oct. 12

Standard deviation $=\sqrt{\frac{4023}{42}} = 9.8$

Risk rises to 10% Sept. 29

Frosts occurred on or before Sept. 29 in 4 years of the 42

Risk rises to 25% Oct. 5

Frosts occurred before Oct. 5 in 9 years of the 42

exactly average in all respects, it is possible to get a very good idea of the percentage of risk after any given date by counting the years in which a killing frost has occurred after this date.[4] It is not likely, however, that the data for extreme cases for any available period will represent exact

[4] See Cleveland Abbe: Frequency of Injurious Phenomena, *Monthly Weather Rev.*, Vol. 27, 1899, pp. 59-60.

average conditions. The actual character of the distribution of all occurrences should furnish a much better guide to the risk with reference to a given number of days after the average date.

There is no record of climatic data for any place in the United States which is of sufficient length to result in a smooth distribution of actual occurrences around the average. The longest available records are those of rainfall, and they are not much over one hundred years in length, while over five hundred observations are generally required to obtain smooth distribution. Frost records are much shorter still, the longest one available covering a period of fifty-nine years. This gives a number of observations much too small to permit the construction of a usable frequency polygon.[5]

The characteristic dispersions of the dates of last killing frost in spring are shown by Figure 1, which was compiled from the records of five stations

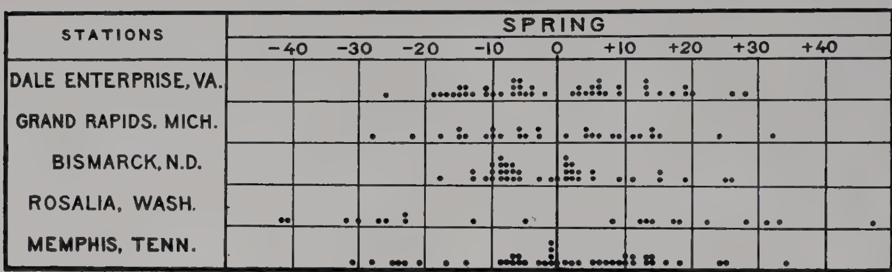

FIG. 1—Number of days before or after the average date on which the last killing frost in spring occurred in each year of record at selected stations.

with different types of dispersion. The figure shows the way in which these dates are actually distributed. The lack of a sufficient number of data to give a smooth polygon may be overcome for phenomena in which the distribution for all stations follows the same type of frequency curve by adding together the records for several stations. If the addition of data from other stations does not change the shape of the frequency polygon but merely tends to smooth the irregularities, it is clear that the distribution for all the stations is similar; or they may be complementary in some cases—a "skew" to the left balancing a "skew" to the right. But, if the records fall into two general classes, one giving frequency polygons "skewed" to the left and the other "skewed" to the right, a bimodal curve results. Since the curve here found is unimodal, it follows that the "skewness" of the curves for individual stations, if it exists, is promiscuous in character. A study of the records of 33 stations with a total of 823 observations shows that the distribution is that of the "normal frequency curve," although there is a slight amount of "skewness," that is, the median does not fall exactly on the mean but is a fraction of a day earlier. Inasmuch as frost either does or does not occur on any particular

[5] See C. B. Davenport: Statistical Methods, 3rd edit., New York, 1914, pp. 11-13.

date, fractions of a date cannot be taken into account; this means that the normal frequency curve fits the distribution of the dates of last killing frost in spring as well as the slightly skewed curve for the combined data. Figure 2 shows the frequency polygon for the 823 observations and the normal frequency curve obtained from this polygon.

The properties of normal frequency curves have been carefully investigated.[6] From the results of this work it is possible to compute the percentage of occurrence of cases falling outside any given date or to compute the date beyond which a given percentage of cases falls. The characteristics of the normal distribution of frost dates (or any phenomenon in which the distribution follows that of the normal frequency curve) may be expressed by a single number, known as the "standard deviation."[7] When the standard deviation of the dates of last killing frost in spring is known for any station, the frost risk may be computed for any date by Table II.

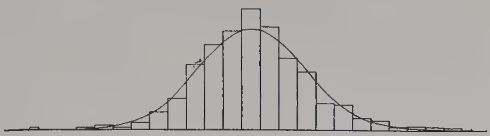

FIG. 2—Frequency polygon and most probable normal frequency curve of the date of last killing frost in spring for the combined records of 33 stations, comprising 823 observations.

TABLE II—RISK OF KILLING FROST IN SPRING

RISK OF OCCURRENCE	NUMBER OF DAYS AFTER THE AVERAGE DATE	EXAMPLE LACROSSE, WISCONSIN
50%	Average date	April 26
40%	0.25 × standard deviation	April 26 + (0.25 × 14.4) = April 30
30%	0.52 × standard deviation	April 26 + (0.52 × 14.4) = May 4
25%	0.67 × standard deviation	April 26 + (0.67 × 14.4) = May 6
20%	0.84 × standard deviation	April 26 + (0.84 × 14.4) = May 9
10%	1.28 × standard deviation	April 26 + (1.28 × 14.4) = May 15

The autumn date when the risk of killing frost rises to a given per cent may be determined by subtracting from the average date the numbers obtained by the use of the standard deviation of the date of first killing frost.

Figure 3 shows the standard deviations of the dates of last killing frost in spring for the United States. The isograms were drawn from the standard deviations determined for 569 stations fairly well distributed over the country; the lines are of necessity somewhat generalized. Figure 4 is a similar map of the standard deviations of first killing frost in autumn.

To compute the time available for plant growth in a given proportion of the years, the most satisfactory method is that based on the risk at each

[6] K. Pearson: Mathematical Contributions to the Theory of Evolution (various papers), *Philos. Trans. Roy. Soc., London: Ser. A*, Vol. 185, 1894, *et seq.*

G. U. Yule: An Introduction to the Theory of Statistics. 2nd edit., Griffin & Co., London, 1912.

C. B. Davenport: Statistical Methods. 3rd. edit., Wiley, New York, 1914.

W. J. Spillman, H. R. Tolley, and W. G. Reed: The Average Interval Curve and Its Application to Meteorological Phenomena, *Monthly Weather Rev.*, Vol. 44, 1916, pp. 197-200.

[7] Mathematically this is the square root of the mean square of the departures of the frost dates in each year from the average of all years. (See C. B. Davenport: Statistical Methods, pp. 15-16.)

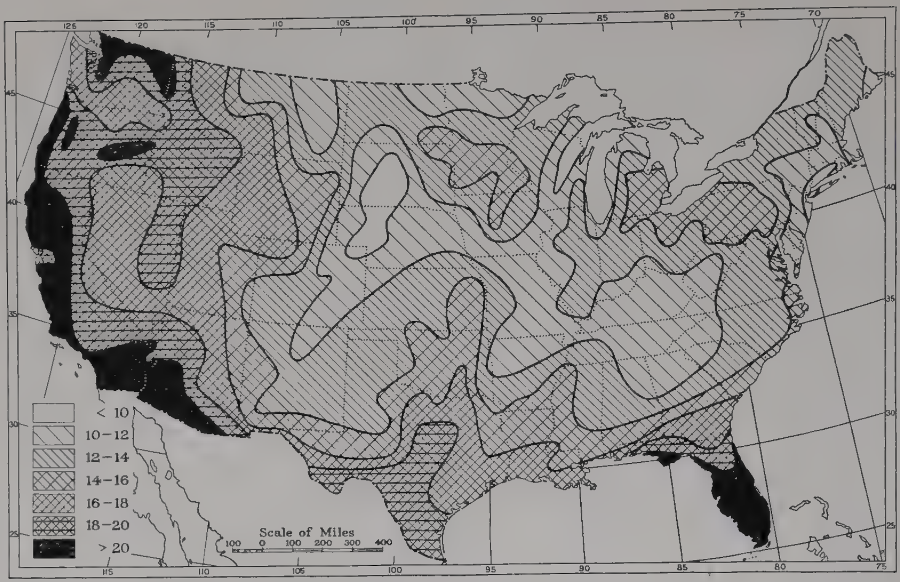

FIG. 3.

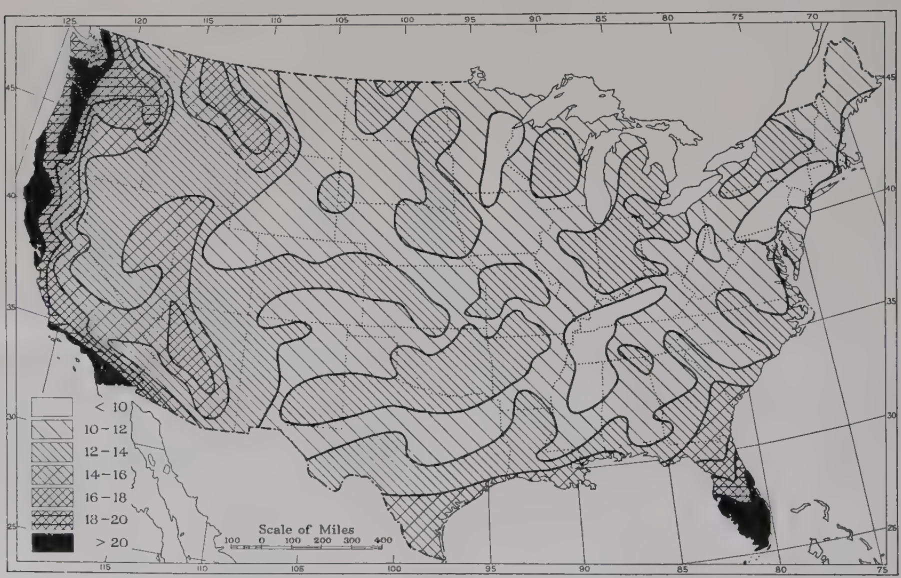

FIG. 4.

FIG. 3—Sketch map of the United States showing standard deviations of dates of last killing frost in spring, compiled from the records of 569 stations.

FIG. 4—Sketch map of the United States showing standard deviations of dates of first killing frost in autumn, compiled from the records of 569 stations.

end of the growing season. If plants are in a condition to be damaged at the average date of last killing frost, the risk to the crop from spring frost is 50 per cent. The risk to plants whose growth requires the whole time until the average date of first killing frost is 50 per cent for each crop which is carried through the summer. Therefore, the chance of a season without killing frost between the average date of last spring frost and the average date of first autumn frost is only 25 per cent.[8] Likewise, the length of a season with any given percentage of risk or safety may be computed. For example, the computed length of the season in which the chance of safety is about 80 per cent is the same as a season with a chance of safety in spring of 90 per cent (risk, 10 per cent) and a chance of safety in autumn of 90 per cent; the chance is that 90 per cent of the crops above ground on the date computed will be carried through the summer, of the crops carried to autumn 90 per cent will not be damaged by frost before the date computed for an autumn risk of 10 per cent.[9]

This method of determining the business risk the farmer has to meet is subject to limitations because of the shortness of the individual records. It is better, however, to determine the risk on the basis of the data for all the years of the record than on the basis of a smaller number of extreme cases. In general the two methods agree closely; of a total of 13,559 observations of last killing frost in spring 1,338 fell outside the computed date after which the risk is less than 10 per cent; if the agreement had been perfect the number would have been 1,356, making a lack of agreement of only 13 cases in 10,000; in the case of 13,600 observations of autumn frost the lack of agreement was only 21 in 10,000.

Statements of risk based upon the results of such a study as this should not be regarded as seasonal forecasts; they simply represent, as far as may be determined from the data now available, the risks the farmer must offset if his business is to be permanently successful. The risk of loss which may be profitably carried varies with the crop and the economic conditions. For those crops in which early production results in higher prices, such as garden vegetables, a considerable risk may be assumed and crops may be lost rather frequently with profit in the long run. In the case of other crops, such as corn, where early production is of little or no advantage, the risk which can be assumed will be much smaller.

Frost is but one of several unfavorable weather conditions involving business risks. The distribution of other phenomena seems to be more complicated, but further studies along this line will doubtless result in determining a method of computing the risk from their occurrence.

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[8] Mathematically this is the product of the two probabilities.

50% may be expressed as $\frac{50}{100}$, then

$$\frac{50}{100} \times \frac{50}{100} = \frac{2500}{10000} = \frac{25}{100} = 25\%$$

[9] $$\frac{90}{100} \times \frac{90}{100} = \frac{8100}{10000} = \frac{81}{100} = 81\%$$

RETURN OF SHACKLETON FROM WEDDELL SEA

The daily press of June 1 reported the arrival, on May 31, at Port Stanley in the Falkland Islands, of Shackleton and five men of his expedition. The practical absence of summer weather had prevented him from carrying out his plan of crossing the Antarctic Continent. When near the land, his vessel, the *Endurance,* was caught in the ice. It was impossible to release her; nor was it possible to land. From that time on, for eight months, the vessel drifted until she was crushed by the ice and finally sank. That the expedition was ultimately saved from disaster is due to the leader's determination and skill. The following account is based on his cablegram to the *New York World,* published in its issue of June 2.

On December 6, 1914, the expedition left South Georgia. On the 8th heavy pack ice was encountered off the Sandwich Islands. The main pack was entered in 58° 40′ S. and 18° W., and Coats Land was sighted on January 10, 1915. Subsequently a new land was discovered, with two hundred miles of coast line and large glaciers discharging into the sea. This was named Caird Coast in honor of James Caird, one of the supporters of the expedition. It presumably connects Coats Land with Prince Regent Luitpold Land.

Abnormal weather conditions prevailed. Contrary to all expectations the temperature was below zero (Fahrenheit) in early February. By the end of the month it fell to 49°, and the old and the young pack were cemented together. Even the animal life was affected by the severe weather, the seals migrating northward in great numbers.

The *Endurance* drifted in a southwesterly direction along the coast as far as what is probably the head of Weddell Sea, as indicated by Filchner's discovery in 1912 of the junction here of the main land-mass and the ice barrier.[1] The southernmost point reached lay in 77° S. and 35° W. From here the drift took on a northwesterly course.

In June began the menace of ice pressure. During the following months the vessel experienced a foretaste of her final fate. On several occasions she was lifted bodily out of the ice; at first she stood the strain, but finally the screwing motion of the floes caused the ship's sides to open. The end came on October 27. The terrific pressure culminated in tearing out the stern and rudder posts, the main deck breaking upward and icebergs piercing the ship. She finally sank on November 20.

After a futile attempt to proceed, the party camped on the floe after saving all the provisions, equipment, and scientific data. From the place where the *Endurance* was crushed, in 69° 5′ S. and 51° 32′ W., the drift continued slowly northward. At the end of the year another attempt was made to go forward. In five days the party advanced only nine miles; the boat, which had to be hauled over the ice, would sink in because of the rotten surface. So the attempt was given up.

In January the Antarctic Circle was crossed. The drift became more rapid. Finally on March 23 the party sighted the distant peaks of Joinville Island, the farthest outpost of Graham Land, but the condition of the ice precluded any attempt to reach the land. On April 8 Clarence Island, the most easterly of the South Shetlands, was sighted. On April 8 the floe on which the camp was pitched split to pieces under the influence of the swell. As the ice opened the three boats were launched. After various narrow escapes Elephant Island, the next major island west of Clarence Island, was reached on April 15. Inaccessible cliffs made landing difficult. Finally a foothold was gained

[1] Erich Przybyllok: Deutsche Antarktische Expedition: Bericht über die Tätigkeit nach Verlassen von Südgeorgien, *Zeitschr. Gesell. für Erdkunde zu Berlin,* 1913, pp. 1-17, with map, 1:5,000,000 (condensed translation in *Bull. Amer. Geogr. Soc.,* Vol. 45, 1913, pp. 423-430).

on a beach which, however, was covered at high tide. To get out of the reach of the waves a cave was hollowed out of the ice above.

Owing to the shortage of food and the inadequate protection against winter, Shackleton decided to try to reach South Georgia, 750 miles distant, and secure relief. On April 24 he set out in a 22-foot boat, with five volunteers. The remaining twenty-two members of the expedition he left in charge of Frank Wild, second in command. On May 8 the cliffs of the west coast of South Georgia were sighted, but it was not possible to land until the 10th and to reach a safe haven, King Haakon Bay, until the

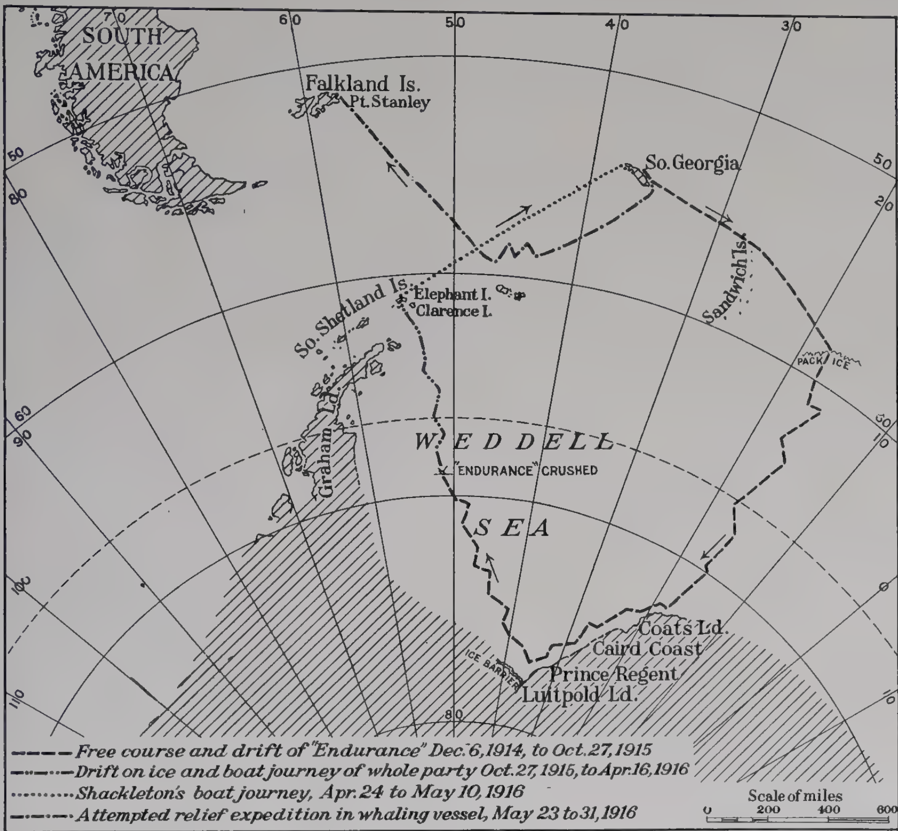

FIG. 1—Sketch map of the Weddell Sea area showing the course of the Shackleton expedition, 1914-16. Scale, 1:38,000,000.

Only the places and positions given in the text are at present definitely known; away from these the courses should be considered approximate and diagrammatic. The position assigned to Caird Coast is inferential.

12th. On the 19th Shackleton, with two of the men, crossed the island to Strömnes whaling station on the east coast, which was reached the next day.

The manager of the station gave every assistance and despatched a boat that same night to bring around the remaining three men of the party. Realizing the urgency of the case he and the managers of the three other whaling stations on the east coast hastened to equip a whaling vessel. By the morning of May 23 it was ready to leave.

The vessel now started for Elephant Island. On the 26th she encountered pack ice and, owing to her unprotected condition and small size, she was forced to stand north. The same situation occurred on the two following days. This and a shortage of coal

finally decided Shackleton to give up the attempt and make for the Falkland Islands, where he arrived on May 31.

Press despatches dated June 6 reported that the government of Uruguay had offered to send the small steamship *Instituto Pesca* of the Bureau of Fisheries from Montevideo to the rescue of the stranded members of the expedition. On June 16 the vessel was at the Falkland Islands, outward bound, with Shackleton on board. On June 27 she was reported to have returned there without fulfilling her mission, not having been able to approach Elephant Island nearer than twenty miles because of the ice. The twenty-two marooned men had, when Shackleton left them on April 24, five weeks' provisions and full rations, exclusive of the possibility of obtaining seals. Nevertheless, he thinks that they will be able to hold out until another rescue party, provided with an ice-breaker, can push through to them. On the opposite side of the Antarctic ten other members of the expedition are waiting to be relieved, as related in the May number of the *Review* (p. 378).

Although the ambitious project of crossing the Antarctic Continent was not carried out, the expedition has had important results. Our knowledge of Weddell Sea has been materially advanced. The drift of the *Endurance,* in its northward section, was about 200 miles west of the hitherto westernmost course, that of the *Deutschland* under Filchner. The expedition, as Shackleton points out in his dispatch, definitely disposes of Morrell's "New South Greenland," over the alleged position of which soundings showed 1,900 fathoms of water. The position and trend of this land as given in the original report[2] make, it would seem, the explanation offered by Mill[3] and by Greely[4] in their Polar manuals self-evident, that Morrell's longitudes were incorrect by about 10° and that he skirted the eastern coast of Graham Land.

With our present knowledge, we may define Weddell Sea as a wide embayment of the South Atlantic enclosed between the main unfolded mass of the Antarctic tableland on the south (Coats Land, Caird Coast, Prince Regent Luitpold Land) and, on the west and north, the folded mountain system of Andean structure and affinity represented by Graham Land, the South Orkneys, the Sandwich Islands, South Georgia, and the connecting submarine ridges. This gulf is open to the east and—probably—closed to the west. Into this pocket the ice is driven by a westerly current which flows along the margin of the land in response to the prevailing easterly winds created by the barometric high-pressure area which lies over the Antarctic Continent. Locally, Weddell Sea is the seat of a low-pressure area, according to the observations of the Nordenskjöld, Bruce, and Filchner expeditions. Into this area the winds blow clockwise in spiral form. The ice on entering the embayment from the east is thus carried along its shores first southwest, then west, north, and northeast until it emerges into the open sea. The drift of the *Endurance* confirms the existence of this circulatory system.

But the ice conditions vary greatly. On the first voyage into this region Weddell, in 1823, reached the remarkably high latitude of 74° 15′ S. without meeting obstruction. A few weeks later Morrell probably reached 70° 14′ S. In 1903 Bruce was beset in 70° 25′ S. and about 18° W. From here to about 60° S. and 45° W. the pack presented an unbroken front. In 1912 Filchner, although frequently meeting pack ice southward from 60° S., was able to proceed as far as 77° 48′ S. near the junction of the land-mass with the ice barrier. On his return he was, however, held fast in 74° S. and drifted north to about 64° S., where the ship was released from the ice. That Shackleton entered

[2] Benjamin Morrell, Jr.: A Narrative of Four Voyages to the South Sea, North and South Pacific Ocean, Chinese Sea, Ethiopic and Southern Atlantic Ocean, Indian and Antarctic Ocean from the Year 1822 to 1831, etc., J. and J. Harper, New York, 1832. Reference on pp. 69-70.

[3] H. R. Mill: The Siege of the South Pole, Stokes, New York, 1905, pp. 109-110.

[4] A. W. Greely: Handbook of Polar Discoveries, Little, Brown & Co., Boston, 5th edit., 1910, p. 306.

the pack ice as far north as 58° 40′ S. and was held fast in it throughout his whole drift from Coats Land to the northern end of Graham Land indicates the extreme conditions prevailing in 1915. These variations may be due, Dr. Henryk Arctowski suggests in a recent article,[5] to a periodic shifting of the Antarctic high-pressure area, which in turn would affect the low-pressure area of Weddell Sea, with consequent changes of the wind direction and the dependent ice circulation in a given area. The shifting of the Antarctic anticyclone he ascribes to the general variations of atmospheric pressure all over the world the existence of which recent researches seem to have demonstrated.

On these matters the oceanographical and meteorological observations, which were maintained throughout the voyage, as Shackleton reports, will throw a flood of light.

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[5] Shackleton's South Polar Expedition: The Value of His Scientific Observations, *Scientific American*, June 17, 1916, pp. 636 and 645.

GEOGRAPHICAL RECORD

NORTH AMERICA

The Caribou Migration on the Yukon Plateau in the Autumn of 1915. Caribou are probably the most migratory of the deer family. While not so swift afoot as the moose or elk they make annual excursions from the Arctic feeding grounds south to the more congenial timber areas of the southern Yukon Territory and Alaska. Caribou

FIG. 1—Caribou migrating southward across the Yukon Plateau near Dawson in November, 1915. (Photo by J. Doody, Dawson, Y. T.)

have been seen as far south as Lynn Canal, a journey of a thousand miles or more from their summer home. In the Yukon Territory little is known of the caribou's summer or winter feeding grounds. They thrive in uninhabited regions where they subsist on moss, lichens, etc., on which horses and cattle would starve. Figures 1 and 2 represent the animals on the march in November, 1915, about 25 miles west of the

FIG. 2—Caribou feeding as they migrate southward, Yukon Plateau near Dawson, November, 1915. (Photo by J. Doody, Dawson, Y. T.)

Yukon River, opposite Dawson. It is estimated that between 8,000 and 10,000 caribou went south by this route, which is not always the one they follow. There was no wanton slaughter of these beautiful animals by the whites or Indians. Each hunter was allowed three carcasses (all under police supervision); and probably 600 were taken for Dawson's winter food-supply. These included both the barren-land caribou (*Rangifer Groenlandicus*) and the woodland caribou (*R. Caribou*). The *Rangifer Caribou* is somewhat longer than the barren-land caribou. For the most part the caribou travel single file in winter and do not, as a rule, disband until they reach permanent feeding grounds. J. H. BROWNLEE.

Break-up of the Yukon River Ice at Dawson. A Dawson resident and Corresponding Member of this Society, Mr. J. H. Brownlee, writes, under date of May 17, a number of interesting items relating to this year's ice movement on the Yukon.

"As the ice 'went out' this year within six hours of the earliest date in twenty-one recorded years, the event has considerable interest for Alaska and Yukon river men and the travelers who wait each year for the waterway to open. The average date of the Yukon break-up at Dawson is between May 10 and May 12. The event is timed by the aid of a wire cable fastened to a prominent pedestal set on the ice midway between shores. The wire is attached to an electric stop-clock ashore set to standard time (9h.) which is used here instead of longitude time (9h. 17m.). The clock stopped at 10h. 3m. A. M. on May 3d and the ice moved downstream the length of a city block and jammed, the water rising behind it and overflowing part of the beach in front of the town."

When the ice breaks a crowd collects, bets are paid, and plans completed for the season's river work which the ice movement heralds. The mouth of the Yukon is free shortly after the middle of June, when up-river steamboat navigation begins. Though the ice causes some destruction it also produces a few beneficial effects. Wooded banks are undermined and the trees swept downstream as drift-wood—an annual contribution of real importance to the desolate shores of the Arctic. The break-up has been the subject of a number of interesting descriptions. Among these are "The Geography and Resources of the Yukon Basin," by William Ogilvie (*Geogr. Journ.*, Vol. 12, 1898, p. 38) and the "Breaking Up of the Yukon," by Captain G. S. Gibbs, U. S. A. (*Natl. Geogr. Mag.*, Vol. 17, 1906, pp. 268-272).

Changes in Indian Life, British Columbia. The plateau Indians of the northern interior of British Columbia, like other members of the Athapascan stock more dependent on vegetable food than the coast tribes, have nevertheless been primarily hunters and fishers. Now a change appears to be in progress. This is noted in the *Report of the Survey Branch of the Department of Public Lands, British Columbia, 1915* (Victoria, B C., 1916) among the Takulli, or Carrier, Indians occupying the Fraser Lake country now tapped by the Grand Trunk Pacific Railway. In common with other tribes these people have entertained an extraordinary delight in horses. They would buy or steal as many as possible, and even the poorest Indian would have at least a single horse. With such a means of improving the "call of the wild" the Indian has naturally paid scant attention to the government agents' attempt to introduce cattle-raising and agriculture, especially as fish has been the chief food resource of this "people-who-go-upon-the-water" (see, under Takulli, "Handbook of Indians of Canada," Ottawa, 1913, reprinted from "Handbook of American Indians North of Mexico," *Bureau of Amer. Ethnol. Bull. 30*). Recent failures in the salmon catch seem to have had an influence in turning the Indian to more settled occupations. Within the last year one Indian reserve has raised 230 acres of oats in addition to garden produce, and another reports the possession of over fifty head of cattle.

This Spring's Catch of the Newfoundland Sealing Fleet. From a St. John's correspondent, Mr. Herbert Knight, we are informed of the phenomenal good fortune of the sealing fleet of Newfoundland. The boats left for the ice fields early in April, and in less than three weeks all that had gone out to the eastern fields were back in port with bumper cargoes. In this short time the crews of the ships made, some as much as $150 per man and none less than $98. The skipper of the largest vessel in the fleet made in the same period over $5,000. These figures are supplemented by a recent *U. S. Commerce Report* (No. 119, May 20, 1916). Only eleven ships, with 2,028 men, were engaged. The catch amounted to 241,302 seals, which, according to the current high prices, are valued at $639,657. From this may be judged the value of the industry to the people of Newfoundland. The fleet which went to the Gulf of St. Lawrence did not return so soon nor did it do so well; but exceptional results are not to be expected in this case because only the weaker vessels frequent that region.

Among the most successful of the ships was the *Terra Nova,* which bore Scott to the Antarctic on his last voyage. Quite a number of Newfoundland sealing vessels have been distinguished in polar exploration. Two years ago the *Southern Cross,* which bore the Borchgrevingk expedition to the Antarctic, foundered while returning home with a load of seals, with the loss of many men.

According to the *U. S. Commerce Reports, Supplement No. 33a,* Dec. 28, 1915, in the Newfoundland seal fishery of 1915 there were engaged twenty steam vessels and 3,959 men. The season began March 15 and closed April 20; and the total catch was 272,965 seals, weighing 5,532 gross tons, and valued at $494,355.

Weather and Crops in the United States. In a paper read before the Pan-American Scientific Congress in December, 1915 (abstract in *Monthly Weather Rev.,* Vol. 44, 1916, pp. 74-75), Professor J. Warren Smith emphasizes certain critical relations which he has discovered in his study of weather and the yield of corn, potatoes, and winter wheat. In the case of corn the most important weather factor is rainfall, and the most important month is July. For potatoes the most important factor is temperature, and the critical month is also July. March is the critical month for winter wheat, and temperature is the most important weather factor. In July the critical rainfall value for corn is 3 inches. A variation of 0.25 inch in the July rainfall in Ohio makes a difference of nearly $3,000,000 in the value of the yield of corn, while a variation of 0.50 inch makes a variation in the yield of over 15,000,000 bushels. In the four greatest corn states of the central United States a variation of 0.50 inch of rainfall at this critical period makes a variation in the value of the amount of corn raised of $5 an acre, or a total of $150,000,000. July must be wet and moderately warm for corn but should be cool and moderately wet for potatoes. If July averages more than 1° a day warmer than the normal, the probability of the potato crop being above the average is only 12 per cent. The correlation between weather conditions and the winter wheat crop is much more difficult to determine. A rather surprising fact, in view of the popular belief to the contrary, is the discovery that in Ohio there seems to be no beneficial result upon the winter wheat crop from a snow cover and no damage from the lack of such a cover. At any rate, the snow cover has no dominating influence. On the contrary it appears that bare ground with freezing and thawing weather in January is beneficial. Snowfall in March is decidedly detrimental to winter wheat.

R. DeC. Ward.

The Melting of Snow in the High Sierras. While much attention has been given to the depth and the distribution of snowfall, comparatively little study has been made of the conditions which determine the disappearance of snow. Prof. A. J. Henry of the U. S. Weather Bureau has recently investigated the weather conditions which may modify or control the disappearance of the snows in the High Sierras of California (*Monthly Weather Rev.,* March, 1916). The most pronounced "snow flood" in the United States is that which passes annually down the Columbia River and which is due almost wholly to the melting snows on the mountains of the Columbia drainage basin. Otherwise "snow floods" are generally rare in the United States, flood conditions being usually brought about by a combination of snow-melting and of heavy rainfall. Professor Henry concludes that, in the High Sierras, the most favorable weather conditions for the conservation of the snow cover are low temperatures and little wind movement. When these conditions prevail, the average loss by evaporation is about three-quarters of an inch per day. Relatively high temperature, active wind movement, and abundance of strong sunshine are the most favorable conditions for the conservation of a snow cover. Under these conditions, the loss of freshly fallen snow may average ten inches a day, and of old snow, three to four inches. R. DeC. Ward.

Geodetic Connection between Mexico and the United States. The U. S. Coast and Geodetic Survey announced the completion in May of the work at the Rio Grande west of Brownsville, Texas, and Matamoros, Mexico, which connects the triangulation systems of the United States and of Mexico. In the United States the arc of primary triangulation extends from the northwestern part of Minnesota southward along the 98th meridian to the Rio Grande, and Mexico had extended an arc of primary triangulation along the 98th meridian from its Pacific coast to the Rio Grande. Mr. E. H. Pagenhart, of the Coast and Geodetic Survey, and Mr. Silverio Alemán, of the Mexican Geodetic Commission, in April and May made the observations from towers erected on both sides of the river, and the work was successfully completed. The length of the completed arc is 2,270 miles. This is a notable event in the history of geodesy and will make it possible to have the maps of the two countries harmonize at the border.

SOUTH AMERICA

The Mineral Resources of Argentina. The extent of Argentina's mineral resources is imperfectly known, and exploitation is only beginning. In 1913 minerals constituted less than one-half of one per cent of the total Argentine exports. The only items of any significance were copper, in ore and bar, wolfram ore, and borates. Statistics of production are not available, but the home consumption was assuredly very small except in the case of Argentina's newest and most valuable mineral product, petroleum. The much-discussed Comodoro Rivadavia oil-fields were discovered in 1907 while boring for water. Up to July, 1915, government-reserve and private wells had produced approximately 27,000,000 gallons (Fernanda de Pedroso: Informe sobre el estado de la exploración y explotación de los yacimientos petrolíferos del Distrito Minero de Comodoro Rivadavia, *Direcc. Gen. de Minas, Geol., e Hidrol., Serie A (Minas), Bol. No. 6*, Buenos Aires, 1915). Yet, according to the *South American Journal* (Vol. 79, No. 20, London, 1915), the present exploitation, inadequate for lack of funds, is little more than sufficient to pay the costs of working, although the shortage of coal offers every inducement for the production of new sources of fuel. Apropos of this scarcity, the same periodical (Vol. 80, No. 18, 1916) states that investigations made in Neuquen have resulted in the discovery of a good quality bituminous coal, but its location, 1,100 miles from Buenos Aires and 300 miles from railhead, renders its development uncertain. Use of *quebracho* wood, exploitation of the peat and lignite beds of Tierra del Fuego and the Uruguayan peat deposits in the vicinity of Montevideo, importation of South African coal, inferior though it is, are other relief measures suggested or in the course of trial (*The South American*, Vol. 4, No. 7, New York, 1916).

Argentina's great and almost untouched mineral resources lie in the Andean provinces. Most of the problems connected with their extraction are expressed in a recent official report relating to a department of the province of Catamarca (Juan F. Barnabé: Informe sobre el Distrito Minero de Tinogasta, *Anal. del Minist. de Agric.: Sección Geol., Mineral., y Minería*, Vol. 10, No. 4, Buenos Aires, 1915). The department of Tinogasta embraces the eastern slopes of the main cordillera of the Andes and a series of the characteristic longitudinal valleys that lie between the buttress ranges trending southward from the Puna de Atacama. Its mineral deposits do not compare favorably with those of the adjacent Chilean province of Copiapó. The reason is physiographic. The vast andesite flows that played so important a part in the ore genesis originally covered a vast area on both flanks of the Cordillera. They are largely denuded from the wetter Chilean slopes; on the Argentine side they remain comparatively unbroken and sterile save for the occasional *salars* of salt and borate. The Tinogasta ore deposits—tin, copper, wolfram, and silver—are practically limited to the great massif of San Francisco and to the eastern sierras of Zapata and Fiambalá. Copper is not a mineral that can be profitably exploited under the pioneer conditions that now obtain in the department. The mineral localities are five or six days from the nearest railroad station, and labor is both scarce and expensive. Gold, silver, even tin, bring immediate returns and involve the initial outlay of much less capital. The richer Chilean fields are more attractive than the remote Argentine region. It is clear that nothing can be done until the projected Andean railroad is brought into the Tinogasta valley and communication established with Rosario. Though the local deposits are valueless save for the distillation of volatile products, other sources of power are close at hand for smelters established in the field. There are considerable woods of the tough, durable, resinous *algarrobo*, useful alike for fuel and mine timber. Some of the trees in these forests are said to attain a thickness of three feet or more. Water power naturally exists in abundance, and some benefit might be extracted from the great curse of the region—the wind.

The climate of the sierras is particularly objectionable; violently stormy in summer, in winter it renders life wretched by the cold and the constant wind, the *zonda*, blowing from the north and excessively dry. According to Hann it is a wind of the föhn type. Worst of all for the miner is the inevitable *puna* or *soroche*, the mountain sickness caused by the altitude and the extraordinary dryness of the air. The latter factor makes the *puna* a source of annoyance even in Fiambalá, at an elevation of little more than 5,000 feet. The main height of the mountainous region is not under 11,500 feet and rises to great elevations. One unnamed peak in the San Francisco massif, 22,573 feet, is reputed to be second only to Aconcagua.

Navigability of the Chilean Fiord Channels as Compared with the Outside Route. The interior route by way of the fiords of southern Chile from the Pacific end of the Straits of Magellan to the Gulf of Peñas in 47° S. has the advantage of providing a smooth-water channel about 300 nautical miles in length. The outside run, in

comparison, is characterized by heavy weather and is used only by full-powered mail steamers, to whose masters time is an all-important factor. According to *Reprint of Hydrographic Information No. 25*, published April 29, 1916, by the U. S. Hydrographic Office, the inner route, which is designated the "Patagonian Channels route," is used by small and medium-sized vessels which are not inconvenienced by the delays of nightly anchorage.

The channels are generally narrow and tortuous and dwindle occasionally, as in English Narrows, the constricted part, in 47° S., of the channel separating Wellington Island from the mainland, to only about 200 yards. The shores generally present abrupt faces. The most dangerous section is English Narrows, both on account of shoals and S turns. Navigators as a rule await slack water at Eden Harbor when proceeding from the south, or at Gray or Halt Harbor when sailing in the opposite direction. Through the whole extent of the channels it is possible to find anchorages every few miles for moderately sized vessels, the longest run between any two being 27 miles.

The prevailing winds blow from north-northwest to south-southwest and are generally squally. Rain or wind is not unusual in the northern portion, while snow and hailstorms prevail at the southern end. The wind force varies between 2 and 6 of the Beaufort scale and occasionally attains 8. The steep walls of the channels maintain the wind-flow in the direction of the gap. According to information reported by naval officers it is possible to take a division of the largest American battleships from Punta Arenas to the Gulf of Peñas through this interior road. It is also of importance for vessels proceeding from nitrate ports in Chile to American Atlantic and Gulf ports.

EUROPE

Land Versus Sea in the War. The geographical aspects of the conflict of Germany's land might with England's sea power is the subject of comment in the weekly edition of the *Berliner Tageblatt* for December 29, 1915. From the shores of the Baltic Sea to the shallow coast of the Persian Gulf the main land thoroughfare and its adjacent territory is in Teutonic hands. Five nations in control of the successive railway sections which provide this central area with the means of transportation are allied to one another. But the northern and southern terminals of this international line are controlled by the guns of another group of nations. France and England are watching the German coasts off the Atlantic as well as the entrance to the Baltic. Italian and Allied men-of-war patrol the entrance of the Adriatic and eastern Mediterranean waters. Cyprus, whose formal entry into the British fold dates from November 5, 1914, mounts guard before the bay of Alexandretta. From Suez southward around the Arabian coast to the Persian Gulf and Indian waters the remainder of the sea ring extends uninterruptedly.

In this conflict between land and sea, transportation problems play an important part. Both sides are well provided. The sea is open to the traffic of the Allies and neutral nations. On land an admirable system of strategic railroads afford communication between bases and field. At Gallipoli and Suez sea power, being under control of land batteries, is in a condition of inferiority. In the same way the gap in the Turkish end of the intercontinental railway line is a source of weakness to the Central Powers.

In this connection it may be worth while mentioning that the greatest conquests in history have been achieved by nations or leaders who ruled over both land and sea. A strong army is of no permanent value without a powerful fleet in the race for world empire. Neither would the mightiest battleship fleet in existence be of any avail for the same purpose without an efficient land force. Where the two occurred together in ancient times, however, the entire known world felt their control. So in our day history will be profoundly influenced by any nation which combines both sea and land power.

This contest between land and sea receives attention from H. G. Dwight, writing in the *Yale Review* for April, 1916, under the title of "The Campaign in Western Asia." Although this caption is singularly ill-chosen, as hardly a word concerning this campaign is mentioned, the article is an enlightening contribution to Persian and Turkish political problems of the day. The writer reviews in brief the historical events which have led to the present military activity in Western Asia. The two Mohammedan nations realize that a thorough invasion of their eastern territory is made by the spirit of Western progress. Russia's expansion toward the south and British occupation of Egypt and India have thrown Turkey into the lap of Germany. The advance of Russian troops alone prevented Persia from following suit.

To Vasco da Gama's memorable journey in 1498 is attributed the beginning of this struggle between land and water. It is the tale of over four centuries of sustained

effort on the part of Europe to control Eastern markets. Rivalry between merchant adventurers of different nations has been conspicuous. The Portuguese first-comers are gradually ousted by the British. French leaders try in vain to succeed to English predominance. Russia alone seems able to widen her sphere of influence in telling fashion, perhaps because of her own half-Asiatic character. In recent years the spectacle of Germany currying Mohammedan favor with considerable success has been apparent.

The competition for railroad concessions in Turkey is touched upon lightly. In spite of Germany's present power in Turkey, relatively little progress in railroad-building has been accomplished. The important Bagdad line has been extended to a point which is dangerously near the path of the Russian army having Bagdad as its objective, and new developments of the Palestine lines are unknown. The latest progress in the west Asian field is the completion of the Julfa-Tabriz line in Persia, the first link of a Russian system of railroads in the country.

Turkey's weak hold over the coast of the Persian Gulf is explained. The Turkish annexation of Bagdad in 1638 was, comparatively speaking, a recent event and the result of victory in the field over the Persians. What might appropriately have been added here is that Turkish sovereignty was never exercised with any degree of authority in the city and its dependent districts until telegraphic communication had been established with the capital some sixty years ago. Even since then the Sultan's representatives have ruled only by taking advantage of internecine Arab feuds. Persian claims to the region, steadily put forward by the shah's representatives, were only disposed of in October, 1914, when the present Turco-Persian frontier was defined by a mixed commission, in which English and Russian representatives participated.

Protecting an Irish Railway from the Wind. The West Clare Railway of Ireland, one of the so-called "Irish light railways" (narrow-gage), runs from Ennis to Kilkee. For 36 miles it follows the Atlantic seaboard, exposed to the full fury of the westerly gales. Derailment of trains in heavy gales has occurred several times. Shelter banks, thrown up on the windward side of the railway, were ineffective and expensive. Finally the Meteorological Office was consulted by the chief engineer of the railroad, and a pressure tube anemometer was installed to give warning of winds of dangerous velocity by ringing a bell in the station-master's house. Two warnings are given, the first when the instrument indicates 65 miles an hour and the second when the velocity rises to 85 miles an hour. When the first warning has been given, 24 hundredweight of movable ballast, kept for the purpose at every station, are put on each car of the train, this being amply sufficient to prevent an overturn. If the second warning comes, the trains are stopped until the storm abates. The anemometer was installed in December, 1909, and has never failed to give the proper warning. One storm-derailment has since taken place, but that was due to deliberate disregard of the instructions (*Symons' Meteorol. Mag.*, March, 1916). R. DEC. WARD.

Mountain Scenery as Viewed by the Greeks and Romans. The attitude of mind in classic times toward mountain scenery forms the subject of an entertaining contribution to the *Classical Journal* (Vol. 11, 1915-16, No. 2, pp. 70-84) by Prof. Walter Woodburn Hyde of the University of Pennsylvania, author of the article on Etna in the June *Review*. The scant notices of scenery in ancient literature tend to prove that early writers were little attracted by the charm of inanimate nature. Life and the world, to them, was centered wholly in their fellowmen, and it was with difficulty that they detached themselves from this idea. So, from Homer down to the Christian period of the Roman Empire, appreciation of the beauty of mountain scenery has never been raised to the pitch of modern admiration.

A deep feeling of sympathy existed, however, for the simpler beauty of pastoral, rural, or sylvan scenes, both among Greeks and Romans. The grandeur and majesty of mountains, if attractive at all, occupied only a subordinate niche in the classical mind, because the harmony which pervaded the tamer scenes was not as fully developed in them. The wildness and ruggedness of nature meant then as little to the civilized or intellectual Mediterranean dweller as it does today to the inhabitant of a district favored by the delights of gentle landscapes.

The explanation for this condition must be sought for in the domain of geography. The Greek and Latin peoples of the Mediterranean basin were pre-eminently seafarers. As sailors, they always regarded the mountain with feelings of aversion and awe. The Greeks, especially, never rose far above sea-level in their search for beauty of scenery. Being dwellers of coast lands, the picturesque in their minds naturally associated itself with the blue sea. Their narrow valley homes assumed width and beauty only as they neared the sea-shore. Furthermore, in Greek mountain scenery, no single peak ever

attains a great altitude, and while respectable elevations are conspicuous in the Greek landscape, the observer never gazes on majestic outlines of the Alpine type. If, bearing the geography of the country in mind, we also remember that the Romans were, after all, but intellectual sons of Hellas, it is easy to understand how Greek viewpoints held sway in the sister peninsula.

A French Example of the Clannish Spirit Fostered by Mountain Environment. In January, 1914, was ratified the treaty of peace concluding a feud whose origin dates back to 1591 (Un procès de trois siècles, *La Montagne*, No. 10-12, French Alpine Club, Paris, 1915). The pertinaceous belligerents were the communes of Nantes-en-Rattier and La Valette, occupying mountain valleys in the department of Isère. For three centuries they had fought over the possession of communal woods on the mountain known as ''Les Passuers et les Taillis.'' At last they have been reconciled; the mountain has been divided. La Valette will pay an indemnity of 4,000 francs and receive certain surrenders in exchange.

POLAR REGIONS

The Relief of the Crocker Land Expedition. It will be recalled by the readers of the *Review* (see February number, p. 145) that the Crocker Land Expedition sent out in the spring of 1913, under the joint auspices of the American Museum of Natural History, the American Geographical Society, and the University of Illinois, was to have been relieved by Doctor Hovey in 1915. On account of unusually severe ice conditions and a disabled engine the relief ship *George B. Cluett* could not proceed farther than North Star Bay, which was reached in September. From here Doctor Hovey proceeded in a motor launch, placed at his disposal by Knud Rasmussen, the Danish explorer, to Etah and brought back to North Star Bay Messrs. Tanquary, Green, Allen, and Ekblaw of the main expedition. Messrs. MacMillan, Small, and Hunt were absent from headquarters, seeking food. Doctor Hovey did not return from Etah in time for the *George B. Cluett* to get out, and she was forced to winter in Parker Snow Bay. Provisions ran short, and in January, 1916, Doctor Hovey and Captain Comer of the relief expedition were forced to leave the ship and look for food, and the party separated. Doctor Hovey, accompanied by Messrs. Tanquary, Allen, and Green, began a sledge journey across Melville Bay, with the object of reaching southern Danish settlements. Owing to his physical condition, Doctor Hovey could not proceed farther than Cape York and returned to North Star Bay. A few days later Messrs. Tanquary, Allen, and Green again set out with sledges and finally reached Egedesminde in southern Greenland. Mr. Tanquary then went on alone to Holstenborg and from there sailed for Copenhagen on the steamer *Hans Egede*, arriving on May 23. Thus both the main party and the relief party are now in need of assistance, and the Crocker Land Committee is sending the steamer *Danmark*, which is now in south Greenland, to the relief of the expedition. The *Danmark* will proceed at once to Etah and other northern ports and, after picking up the members of the expedition, will land them either at St. John's, Newfoundland, or Sydney, Cape Breton, late in August or early in September. Mr. Tanquary sailed from Copenhagen June 8 and arrived in New York on June 20. He has brought with him full reports of the work of the expedition up to the spring of this year.

Rasmussen's Crossing of Greenland in 1912, and His Plans for the Present Summer. The record of a remarkable sledge journey across northern Greenland is found in Knud Rasmussen's ''Report of the First Thule Expedition, 1912'' (*Meddelelser om Grønland*, Vol. 51, 1915, pp. 285-340) and in the account of his comrade Peter Freuchen in the same volume (pp. 343-370). (For an account of the various crossings of Greenland, together with map, see the *Geogr. Journ.*, Vol. 42, 1913, p. 546. A better map is now available on page 286 of the report noted herein.) The route lay from Clements Markham Glacier on the west coast just south of Etah to the head of Danmark Fiord, then down this fiord and up Independence Fiord, and back again to the west coast at Thule, a station recently established a little to the south of Etah. On the inward (eastward) journey the explorers made an average run of 38.4 miles a day and on the return 26.6 miles. The distance covered from the west coast to the east was 650 miles. At Navy Cliff the explorers walked literally in the still visible footsteps left by Peary and Astrup twenty years before. The monotonous country, the storm-swept desert of ice, gave the expedition much trouble. The loss of three dogs in the deep crevasses at the northeastern edge of the main ice sheet and the constant risk to the explorers themselves is told with dramatic simplicity. The greatest altitude reached was 2,225 meters (7,298 feet). At the edge of Peary Land, in latitude 82° 10′ N., close to the mouth of Brönlund Fiord, old Eskimo tent rings were found, one of the most interesting discoveries of the expedition. They faced the fiord (northeast), with entrances

looking out toward the fiord, where there is plenty of seal; in the uplands behind are musk-ox, hare, and ptarmigan. Remains of the winter houses of the Eskimo were not found. Besides numerous scientific observations of great value the expedition made a good map of the head of Independence Fiord. The discovery by Mylius Erichsen of the non-existence of Peary Channel is thus confirmed by cartographic evidence (see the article, with map, in the June *Review*, pp. 448-452). The northwestern edge of the fiord was traversed and the ascent to the ice made over Nyeboe Glacier. The general map, Plate XII, shows a great predominance of wind directions straight off the ice. These anti-cyclonic conditions support the current theory of the dominating atmospheric control exercised by great ice caps.

In order to complete the exploration of the region where Peary Land is attached to the mainland of Greenland, Rasmussen is again engaged in an expedition this summer. He left Copenhagen on April 1 and reached Holstenborg on the southwestern coast about April 20. Here he intended to board his vessel the *Kap York* and hoped to arrive at Thule in order to begin his cross-journey by June 1. He was again to be accompanied by Peter Freuchen as topographer and also by Lange Koch as geologist and two Eskimos from the Cape York district. The route will lie from Clements Markham Glacier to Sherard Osborne Fiord on the north coast. Here, if possible, the descent from the inland ice will be made and the journey continued to Nordenskiöld Inlet (see map in the June *Review*, p. 450) and thence through the critical region to the head of Independence Fiord. If it is impracticable to descend from the inland ice at Sherard Osborne Fiord, the course will be shaped directly for Independence Fiord. Rasmussen expects to return about August 10 or 15 so as to reach Thule in time to catch the *Kap York*, which will sail for Denmark early in September. In addition to the topographical surveys, geological and ethnographical—mainly relating to Eskimo migrations—investigations will be made.

In case untoward circumstances prevent Rasmussen from beginning the ascent of the inland ice by June 1, the latest possible date, he has arranged for an alternative expedition to Melville Bay. This bay has never been thoroughly studied, and yet it is of the greatest importance with regard to Eskimo migrations on the west coast. It is intermediate between the inhabited Cape York and Upernivik districts, although itself uninhabited throughout the whole period of Danish colonization. Across it the Eskimos must have gone in their southward migration. This is a question which Rasmussen would like to settle before he sets out on his contemplated expedition to the American Eskimos which will extend over several years.

WORLD AS A WHOLE AND LARGER PARTS

The Strategic Geography of the British Empire. With the hope of furthering the study of the strategic geography of the British Empire, that it might "become a citizen's subject throughout the British lands," a paper under this title was delivered early in the year by Vaughan Cornish before the Royal Colonial Institute (*United Empire*, Vol. 7, N. S., No. 2, London, 1916). The worldwide distribution of the Empire's recruiting and supply bases leads to special emphasis on the lines of communication. The major lines embrace most of the great trade routes of the world. They include the routes between Canada and the British Isles, and the British Isles and India and Australia. The latter proceeds via the "great maritime defile" of the Mediterranean with its terminal "stops" of Gibraltar and Aden and the median stops of Egypt and the Suez Canal. The location of Egypt gives it great utility as a central depot. India and Australia may be considered as occupying two apexes of the triangular Indian Ocean, the third being occupied by the Cape. The Cape also possesses a central location whose value would, of course, be greatly augmented in event of closure of the Suez route. Lines of communication across the Pacific are far less important; indeed this ocean is rather to be regarded as a gap. Its primary use would be as a route for carrying men and supplies to India if the Suez route were not available.

North of the "great maritime defile" lies the "land defile" of Constantinople. Its value to the Central Powers is as a naval base for attack on Egypt and as a line of communication to India via Persia either northward through Kabul and Quetta or southward to Karachi, hence the importance of British control in the Tigris and Euphrates delta, as well as occupation of positions in or on the Persian Gulf. To maintain communications westward from the defile it is necessary to pass through the corridor country of Bulgaria and thence via Rumania or Serbia. The latter, taking advantage of the Nish-Saloniki railroad, is preferable. Connection is thus made with the great naval and military bases of the Central Powers, i. e. the Cologne and Hamburg district. The North Sea outlet of this district occupies a location inferior

to that of the Low Countries as a base for aërial or naval attack on Great Britain. Britain holds this sea by commanding the passages between Kent and France and between the Orkneys and Norway, though, for purposes of commercial blockade, the line has to be extended by patrol northwards into polar latitudes. In respect of strategic geography, Ireland, it must be remembered, holds a position relative to the major island analogous to that of Britain relative to the continent.

GEOGRAPHICAL NEWS

Excursion of the Geographic Society of Chicago to the St. Lawrence. The Geographic Society of Chicago has arranged for its members and their friends an excursion to the St. Lawrence region from July 17 to 28. The itinerary is as follows: Leave Chicago, July 17; Toronto, July 18; Kingston, July 19; Montreal, July 19; Quebec, July 20; Chicoutimi, July 20-21; Quebec, July 22; Montreal, July 23-24; Chazy, N. Y., July 24; Plattsburg, July 24; Ausable Chasm, July 25-26; Ticonderoga, July 26; Lake George, July 26; Saratoga, July 26-27; Albany, July 27-28; New York or Boston, July 28. The trip will cost from $125 to $130. All inquiries should be directed to Mr. O. M. Schantz, Chairman of the Excursion Committee, Otis Building, 10 South La Salle Street, Chicago, Ill.

Fifth Brazilian Geographical Congress. The Fifth Brazilian Geographical Congress will be held September 7 to 16, 1916, in Bahia under the auspices of the state of Bahia and the Instituto Geographico e Historico of Bahia. The congress will be subdivided into twelve sections, as follows: I, Mathematical Geography (astronomical geography, topography, geodesy); II, Physical Geography (aërology, oceanography, geomorphology); III, Physical Geography (hydrography, potamology, limnology); IV, Vulcanology and Seismology; V, Climatology and Medical Geography; VI, Biogeography (phytogeography and zoögeography); VII, Human Geography; VIII, Political and Social Geography; IX, Economic and Commercial Geography, including Agricultural Geography; X, Military and Historical Geography; XI, Teaching of Geography, Rules and Nomenclature; XII, Regional Monographs. Papers intended for presentation should be sent to reach the Secretary of the Organizing Committee not later than August 30. Only papers not previously published will be accepted and they should be in typewritten form. The final program of the congress will be distributed at the opening session. In addition to the regular sessions, there will be a geographical exhibit, consisting of Brazilian works on geography, maps and photographs, geographical apparatuses, and a gallery of native and foreign geographers who have contributed to the study of the geography of Brazil. The membership fee is: for individuals, 10 milreis ($5.46); for societies, 20 milreis.

Geographical Recommendations of the Second Pan-American Scientific Congress. The following recommendations and suggestions adopted on January 8, 1916, at the final session of the Second Pan-American Scientific Congress in Washington, D. C., are of interest to geographers. They are reproduced from an abstract in *Science* for February 11, 1916 (pp. 202-204). A full statement is contained in "The Final Act" of the congress, prepared by J. B. Scott (Government Printing Office, Washington, D. C., 1916). The congress recommends—

Art. III. That the American republics undertake as soon as possible: (a) accurate, geodetic measurements which may serve to determine limits, national and international, and to contribute to the discovery of the true shape of our planet; (b) magnetic measurements of their respective surfaces, and the establishment of several permanent magnetic observatories in which it may be possible to carry on during long periods of time observations concerning the secular variation of the magnetic characters of the earth; (c) to extend their gravimetric measures (obtained by means of the pendulum) to those regions where these measurements may not have been taken, in order to obtain more information to determine the true shape of the surface and the distribution of the terrestrial mass.

Art. IV. That the nations of the American continent establish, by means of their offices of geodesy or by committees appointed for that purpose, an international triangulation; that the governments of American nations reach an agreement for the purpose of creating an office or congress of cartography and geography.

Art. V. That proper steps and measures be taken to bring about in the American republics participating in the congress a general use of the metric system of weights and measures, in the press, in educational and scientific work, in the industries, in commerce, in transportation, and in all the activities of the different governments.

Art. VI. That, as recommended by the First Pan-American Scientific Congress, meteorological organizations be installed to serve as a basis for the establishment of the Pan-American meteorological service; and that the republics not yet possessing organized meteorological service establish the same as soon as may be practicable.

Art. VIII. That an American committee on radio communication be appointed to assist in development of the science and art of radio communication, to the end that it may serve to convey intelligence over long distances and between ships at sea more quickly and accurately, and to bring into closer contact all of the American republics.

Art. XI. That the question of the reclamation of arid lands is one that should receive the immediate and careful consideration of the several governments of the American states, so that there may be increased areas of productive land to meet the needs of their increased populations.

Art. XIV. That information be disseminated regarding the agricultural production of the different countries and of the publications relating thereto.

Art. XXXVI. That the American republics make uniform, as far as possible, the basis and adopt a common time for the taking of census, and adopt uniform principles in commercial and demographic statistics.

In conclusion, the congress specially recommends, for execution by the present Pan-American Union or by means of any other institution in actual existence or to be established, the following propositions:

The establishment of an intellectual Pan-American union to unite the various associations of different character—technical, medical, legal, etc.—divided into sections according to the groups that may be deemed convenient, such as a university section, a library section, etc.

The details thereof are contained in the records of the congress in the form of four propositions dealing with the proposed union. The organization that may take charge of its establishment will lay broad and deep the true foundations of intellectual Pan-Americanism.

Summer Session Courses in Geography

(*Unless otherwise noted, the instructors belong to the faculty of the institution at which they are giving courses.*)

Boston University, Boston, Mass. (July 8–August 19).
- Natural Resources. Asst. Prof. R. B. Wilson.
- Economic History of the United States. Asst. Prof. C. P. Huse.

University of California, Berkeley (June 26–August 5).
- An Introduction to College Physiography. Mr. Paul Vander Eike of the Bakersfield (Cal.) Junior College.
- Field Course in Physiography in the Mount Whitney Region of the Sierra Nevada. Dr. J. P. Buwalda.
- Physical Geography in the High School. Mr. Paul Vander Eike.
- Economic Geography. Mr. E. W. Barnhart of the Berkeley (Cal.) High School.
- Geographic Botany of the Pacific Coast. Mr. F. J. Smiley.
- Race. Asst. Prof. T. T. Waterman.

University of Chicago (June 19–July 26 and July 27–September 1).
- Physiography. Prof. R. D. Salisbury and Asst. Prof. R. T. Chamberlin, first term; Dr. E. A. Stephenson, second term.
- Mineral Resources of North America: Introduction to Economic Geology. Mr. R. C. Moore.
- Field and Laboratory Course in Geology. Dr. E. A. Stephenson. Second term.
- Principles of Geography. Prof. R. H. Whitbeck of the University of Wisconsin. First term.
- Economic and Commercial Geography. Assoc. Prof. J. P. Goode.
- Political Geography. Assoc. Prof. W. S. Tower.
- Geography of North America. Miss M. J. Lanier.
- Economic Geography of the United States. Assoc. Prof. J. P. Goode.
- Influence of Geography on American History. Miss M. J. Lanier.
- Geography of South America. Assoc. Prof. W. S. Tower.
- Geography in the High Schools. Prof. R. H. Whitbeck. First term.
- Geography in the Primary Grades: Home and World Geography. Assoc. Prof. Zonia Baber.
- Geography in the Grammar Grades: North America. Assoc. Prof. Zonia Baber.

Field Course in Geology at Devil's Lake, Wisconsin. Dr. E. A. Stephenson, first term; Prof. A. C. Trowbridge of the University of Iowa, second term.
Field Course in Geology in Saint Genevieve County, Missouri. Prof. Stuart Weller. June 19–July 17.
Field Course in the Geology of the Cascade Mountains, Oregon. Asst. Prof. J. H. Bretz. August 1–31.
Field Course in Geography in the Environs of Chicago. Mr. T. R. Taylor. Second term.
Field Course in Geography in the Lower Saint Lawrence Valley. Assoc. Prof. W. S. Tower. September 2–30.
Physiographic Plant Ecology. Prof. H. C. Cowles and Dr. G. D. Fuller.
Ethnology. Assoc. Prof. Frederick Starr.
The American Race. Assoc. Prof. Frederick Starr.

Cleveland School of Education (conducted jointly by Western Reserve University and the Cleveland Normal School), Cleveland, Ohio (June 19–July 28).
Methods in Elementary Geography and Local Field Studies. Prof. W. M. Gregory of the Cleveland Normal School.
Industrial Geography and Studies of Cleveland's Industries. Prof. W. M. Gregory.
Excursion to Glacier National Park. Prof. W. M. Gregory. July 31 to September 2.

University of Colorado, Boulder (June 26–August 5).
Principles of Earth Science. Prof. W. E. McCourt of Washington University, St. Louis.
Field Geology. Prof. W. E. McCourt.
Geographic Influences. Prof. W. E. McCourt.
Climatology. Prof. W. E. McCourt.
Geographic and Geologic Excursion to Interesting Places in Colorado, Utah, and Wyoming. Prof. W. E. McCourt. August 5–29.
Special Lectures: (1) The Evolution of the Map; (2) Work and Weather. Prof. W. E. McCourt.

Columbia University, New York City (July 10–August 18).
Mathematical Geography. Prof. Harold Jacoby.
Geodetic Surveying. Field work at Camp Columbia, Morris, Conn. Prof. Harold Jacoby, Mr. William Bowie of the U. S. Coast and Geodetic Survey, and assistants. July 5–26.
Physical Geography and Its Economics Aspects. Assoc. Prof. D. W. Johnson and Mr. A. K. Lobeck.
Physiography of the Eastern United States. Assoc. Prof. D. W. Johnson.
Field Work in Physiography in the Environs of New York City and the Eastern Section of New York State. Assoc. Prof. D. W. Johnson and Mr. A. K. Lobeck.
Geographical Delineation and Map Interpretation. Mr. A. K. Lobeck.
Commercial Geography. Prof. C. T. McFarlane.
Geography of Industry and Trade. Prof. C. T. McFarlane.
International Trade. Prof. W. F. Gephart of Washington University, St. Louis.
Geography of Europe, with Special Reference to the European War. Assoc. Prof. D. W. Johnson.
The Teaching of Geography in the Lower Grades. Miss C. B. Kirchwey.
The Teaching of Geography in the Upper Grades. Miss C. B. Kirchwey.
The Teaching of Regional Geography in the Junior High School. Miss C. B. Kirchwey.
Continental Geography for the Elementary School. Miss C. B. Kirchwey.

Cornell University, Ithaca, N. Y. (July 6–August 16).
Physical Geography. Asst. Prof. O. D. von Engeln.
Commercial and Industrial Geography. Asst. Prof. O. D. von Engeln.
Physical Geography, Laboratory Course. Mr. E. D. Elston.
Field Course in Geography and Geology. Asst. Prof. O. D. von Engeln and assistants.
Short local excursions; all-day excursions to Taughannock Gorge and Falls, July 15, Enfield Gorge and Falls, July 29, east shore of Cayuga Lake, August 5; and longer excursions to Niagara Falls and Gorge, August 12 and 13, and Watkins Glen, July 22. Asst. Prof. O. D. von Engeln and assistants.

Denison University, Granville, Ohio (June 19–July 28).
Industrial Geography. Prof. Frank Carney.
Geography of South America. Mr. J. M. Asensio of the U. S. Military Academy at West Point.
Teacher's Course in Geography. Prof. Frank Carney.
Round Table Conferences in Geography. Prof. Frank Carney.

University of Denver, Denver, Colo. (June 19–July 28).
Commercial Geography. Prof. G. A. Warfield.

Harvard University, Cambridge, Mass. (July 10–August 19).
Course in Field Geology in the San Juan Mountains, southwestern Colorado. Prof. W. W. Atwood and Dr. W. P. Haynes.
Physiographic Field Studies. Prof. W. W. Atwood.
Economic History of Europe and the United States during the Nineteenth Century. Prof. E. F. Gay.

University of Illinois, Urbana (June 19–August 11).
Economic Resources. Asst. Prof. Simon Litman.
Economic Phases of United States History, 1820–1860. Dr. C. M. Thompson.
Animal Ecology. Asst. Prof. V. E. Shelford.

State Normal School, Terre Haute, Indiana.
History of the Earth and Its Inhabitants. Mr. W. A. McBeth.
Elements of Geography. Mr. B. H. Schockel.
Regional Geography of Nations. Mr. W. A. McBeth.
Social Geography: Institutions and Life of Nations. Mr. B. H. Schockel.
Regional Geography of Europe. Mr. W. A. McBeth.
Geographic Influences in American History. Mr. B. H. Schockel.

Indiana University, Bloomington (June 15–August 11).
Economic Geography. Asst. Prof. F. E. Williams of the University of Wisconsin.
Relation of Geography to American History. Asst. Prof. F. E. Williams.
Teaching of Geography. Asst. Prof. F. E. Williams.
Conservation of Natural Resources. Prof. E. R. Cumings.
Course in Field Geology of the Clay City (Ind.) Quadrangle. Assoc. Prof. J. W. Beede.
History of Indiana [including early exploration and settlement]. Dr. Logan Esarey.

University of Iowa, Iowa City (June 19–August 26).
Physical Geography. Prof. A. C. Trowbridge and Mr. W. D. Shipton.
Physical Geography. Asst. Prof. A. O. Thomas.
Physiography of Iowa. Prof. J. L. Tilton of Simpson College. [At the Iowa Lakeside Laboratory at Lake Okoboji.]
The Evolution of the Western States. Asst. Prof. Louis Pelzer.
Foreign Commerce of the United States. Prof. P. S. Peirce.

Johns Hopkins University, Baltimore, Md. (July 5–August 15).
Physical and Economic Geography. Mr. D. G. Thompson of Goucher College.

University of Kansas, Lawrence (June 8–July 19 and July 20–August 16).
Physiography. Prof. Erasmus Haworth (June 8–July 19).
Commercial Geography. Asst. Prof. W. McG. Duffus.

Leland Stanford Junior University, Stanford University, Cal.
Course in Field Geology in the Santa Inez Range near Santa Barbara, California. Prof. Bailey Willis and Prof. D. M. Folsom.

Louisiana State University, Baton Rouge (June 5–August 4).
Geological and Geographical Field Work in the Asheville Region in North Carolina. Prof. F. V. Emerson. August 9–30.

University of Michigan, Ann Arbor (July 3–August 25).
Teacher's Course in Physiography. Dr. C. O. Sauer and assistant.
Geographic Influences. Dr. C. O. Sauer and assistant.
Commercial Geography. Dr. C. O. Sauer and assistant.
Special Lecture on the Geology of Niagara Falls. Dr. C. O. Sauer. July 19.
Excursion to Niagara Falls under the direction of Dr. C. O. Sauer. July 21ff.
Special Lecture on Early American Cartography. Mr. W. L. Clements, Regent of the University of Michigan, Bay City, Mich.

University of Minnesota, Minneapolis (June 12–July 21).
Physiography. Asst. Prof. C. J. Posey.
Geography of North America. Asst. Prof. C. J. Posey.
Teacher's Course in Geography. Asst. Prof. C. J. Posey.
Four Field Courses in Geography: (1) Isle Royal, June 21–July 24; (2) northeastern Minnesota, July 5–July 18; (3) central Colorado, Yellowstone National Park, July 25–August 8; (4) Glacier National Park, August 8–21. Asst. Prof. E. M. Lehnerts.

University of Missouri, Columbia (June 8–August 4).
Fundamentals of Physical and Human Geography. Dr. A. E. Parkins.
Geographic Influences in American History. Dr. A. E. Parkins.
Teacher's Geography. Dr. A. E. Parkins and Prof. L. F. Thomas.
Geographical Excursion to the Mississippi River and the Great Lakes. Dr. A. E. Parkins. August 7–21.

University of Montana, Missoula (June 19–July 29).
Physiography. Prof. J. P. Rowe, and Mr. E. E. Holmes of the College of Montana, Deerlodge, Mont.
Geography and Geology of Montana. Prof. J. P. Rowe and Mr. E. E. Holmes.
History of Montana [exploration, settlement, and development]. Dr. H. H. Swain, Assistant State Superintendent of Public Instruction.
Physiography of the Region about the Biological Station at Yellow Bay on Flathead Lake. Prof. J. M. Elrod.

University of Nebraska, Lincoln.
Physical Geography. Assoc. Prof. N. A. Bengtson.
Industrial Geography. Assoc. Prof. N. A. Bengtson.
Geography of Nebraska. Assoc. Prof. N. A. Bengtson.
Geographical Short Trips to Local Points. Assoc. Prof. N. A. Bengtson.
Geological Excursion to the Black Hills and Rocky Mountains Region. Prof. E. H. Barbour and Asst. Prof. E. F. Schramm.
Commercial Geography. Dr. Minnie T. England.
Economic History of the United States. Prof. G. O. Virtue.

Nebraska Wesleyan University, Lincoln (June 6–July 28).
Geography of the United States. Prof. W. G. Bishop.
Industrial Geography. Prof. W. G. Bishop.
Normal [i. e. general world] Geography. Prof. W. G. Bishop.
Physical Geography. Prof. W. G. Bishop.

New York University, New York City (July 10–August 18).
Principles of Economic Geography. Assoc. Prof. R. B. Earle of Hunter College, New York City.
Field Course in General Physiography and Geology. Prof. J. E. Woodman.
Special Topics in Geography and Geology. Prof. J. E. Woodman and Dr. R. B. Earle.
Research in Geography and Geology. Prof. J. E. Woodman and Dr. R. B. Earle.
Methods of Teaching Business Arithmetic, Business Law, and Commercial Geography. Mr. W. A. Barber.
Geodesy. Prof. Alexander Haring.

University of North Carolina, Chapel Hill (June 13–July 28).
General Geography. Mr. J. E. Smith.
High School Geography. Mr. J. E. Smith.
Elementary Geography. Mr. J. E. Smith.
The Teaching of Geography. Prof. M. C. S. Noble.
Recent Industrial Development of North Carolina. Dr. J. H. Pratt, State Geologist. [Series of ten lectures, July 3–14.]

University of North Dakota, University (June 19–July 28).
Physiography. Assoc. Prof. H. E. Simpson.
Field Geology and Physiography at the Biological Station at Devil's Lake. Assoc. Prof. H. E. Simpson.
Latin America. [Survey of the geography, history, races, civil development, nature of business opportunities.] Prof. H. R. Brush.

Northwestern University, Evanston, Ill. (June 26–August 5).
General Geology: Introduction to Geology and the Physiography of the Lands. Prof. U. S. Grant.
Geology and Physiography of the United States. Prof. U. S. Grant.
Field Course in the Upper Lake Superior Region. Prof. U. S. Grant.

Oberlin College, Oberlin, Ohio (June 16–August 3).
Field Course in Geology in the Deerfield River Region of Southern Vermont. Prof. G. D. Hubbard.
Physical, Political, Commercial, and Historical Geography of England. Prof. L. B. Hall.

Ohio State University, Columbus (June 19–August 11).
Physiography. Asst. Prof. J. E. Carman of the University of Cincinnati.
The Teaching of Physiography. Asst. Prof. J. E. Carman.

University of Oregon, Eugene (June 19–July 28).
Meteorology. Asst. Prof. A. E. Caswell.

George Peabody College for Teachers, Nashville, Tenn. (June 15–July 21 and July 22–August 26).
Elements and Principles of Geography: Section 1. Assoc. Prof. C. C. Colby.
Elements and Principles of Geography: Section 2. Miss Mary Dopp of the Harper High School, Chicago.
Commercial Geography. Assoc. Prof. C. C. Colby.
Geography, Peoples, and Commerce of South America. Assoc. Prof. C. C. Colby.
The Influence of Geography on American History. Miss Mary Dopp.
Industrial History of the United States. Prof. Eugene Fair of the State Normal School, Kirksville, Mo.
Economic History of the United States. Prof. W. E. Morrow of the State Normal School, Warrensburg, Mo. Second term.

Pennsylvania State College, State College, Pa. (June 26–August 4).
Physical Geography. Dr. H. J. Roddy of the Millersville (Pa.) State Normal School.
Teacher's Geography. Prof. H. J. Roddy.
The Teaching of Geography and History in Elementary Schools. Miss Anne U. Wert of the Teachers' Training School, Harrisburg, Pa.
The Teaching of Geography and History in the Fifth and Sixth Grades. Miss Anne U. Wert.
The Teaching of Geography and History in the Seventh and Eighth Grades. Miss Anne U. Wert.
Economic History of the United States. Dr. A. E. Martin.

University of Pennsylvania, Philadelphia (July 6–August 18).
Commercial Geography of the United States. Asst. Prof. G. B. Roorbach.
Climate and Its Economic Influences. Asst. Prof. G. B. Roorbach.
Resources and Industries of South America. Asst. Prof. G. B. Roorbach.
Introduction to Anthropology. Mr. R. T. Aitken.
The North American Indian. Mr. R. T. Aitken.
Peoples of the Pacific. Mr. R. T. Aitken.

University of South Carolina, Columbia (June 26–July 21).
Physical Geography. Prof. A. C. Moore.

University of South Dakota, Vermillion (June 19–July 29).
Geography and the Teaching of Geography. Mr. M. C. Helm, Superintendent of Schools, Pierre, S. D.
Physical Geography and the Teaching of Physical Geography. Mr. M. C. Helm.

University of Tennessee: Summer School of the South, Knoxville (June 20–July 28).
Home and World Geography (for Primary Teachers). Miss Bertha Henderson of the University High School, University of Chicago.
North America (for Teachers of Grammar Grades). Miss Bertha Henderson.
Physical and Commercial Geography (for High School Teachers). Miss Bertha Henderson.

University of Texas, Austin (June 12–July 27).
Physiography: Introduction to Science. Prof. F. W. Simonds.
Physiography: Continuation of the Previous Course. Prof. F. W. Simonds.
The Economic and Commercial Geography of the Southwest. Prof. L. M. Keasbey.
General Geography. Mr. E. G. Littlejohn of the Alamo School, Galveston.
Physical Geography. Mr. E. G. Littlejohn.

Tulane University of Louisiana, New Orleans (June 12–July 22).
Geography. Mr. C. C. Hensen, Principal of the Newman Normal Training School, New Orleans.
Physiography. Asst. Director J. A. Lyon.

University of Utah, Salt Lake City (June 12–July 21).
The Teaching of Geography. Miss Anna Youngberg.
The Teaching of Nature-Geography, History and Civics: Primary Methods. Miss Anna Youngberg.

University of Virginia, Charlottesville (June 20–August 3).
Physical Geography. Miss L. C. Kelley of the John Marshall High School, Richmond, Va.
Industrial Geography. Miss L. C. Kelley.
Aims and Methods in Geography. Miss L. C. Kelley.
Latin American Social Development [a study of the human geography of the Latin-American States]. Adjunct Prof. J. C. Bardin.

State College of Washington, Pullman (June 19–July 29).
- Review Courses for Examination and Certification in Geography and Physical Geography. [Instructor not given.]

University of Washington, Seattle (June 19–July 28).
- Physical and Regional Geography. Prof. Henry Landes.
- Traveling Course in Geology to the Glacier National Park and Yellowstone National Park. Prof. E. J. Saunders. June 19 to July 28.
- Three General Lectures on "Discoveries in the Northwest," "Explorations in the Northwest," and "Occupation of the Northwest." Prof. E. S. Meany.
- Three General Lectures on "Geografia Física, Politica y Economica de Argentina," "Geografia Física, Politica y Economica del Brasil," "Geografia Física, Politica y Economica del Peru y de Bolivia." Mr. L. A. Santander.
- Physiography and Meteorology. Dr. M. M. Leighton.

West Virginia University, Morgantown (June 19–July 29).
- The Teaching of Arithmetic, Geography and History. Miss S. E. Griswold of the Chicago Normal School.
- American Social and Economic History. Mr. C. P. Higby of the Fairmont (Va.) State Normal School.

University of Wisconsin, Madison (June 26–August 1).
- Physical and Applied Geography. Asst. Prof. Edward Steidtmann.
- Glaciers and Glaciation. Prof. Lawrence Martin.
- Field Course in Physiography and Geology at Devil's Lake, Wisconsin. Prof. Lawrence Martin. August 7–September 2.
- Commercial and Industrial Geography. Prof. Lawrence Martin.
- Agricultural Geography. Mr. V. C. Finch.
- Geography of South America. Mr. V. C. Finch.
- Geography of Wisconsin. Prof. Lawrence Martin.
- Climate and Man. Mr. E. R. Miller of the U. S. Weather Bureau.
- Topographical Surveying: Field and Office Practice in Camp at Devil's Lake. Assoc. Prof. L. S. Smith and assistants.

Personal

Dr. Charles C. Adams of the New York State College of Forestry at Syracuse University will, this summer, be in charge of the fish survey of Oneida Lake which was begun last year. Last summer the western half of the lake was covered, and this season the remainder of the lake will be surveyed. Professor T. L. Hankinson will collaborate with Doctor Adams.

Dr. Henryk Arctowski, Chief of the Science Division of the New York Public Library, is engaged, in collaboration with Mr. L. Kirsch, in the preparation of a study of the seasonal changes of storm frequency distribution in the United States.

Professor Wallace W. Atwood of Harvard University, in addition to his direction of the summer field work in the San Juan mountain region of southwestern Colorado, noted elsewhere, will also have charge of a U. S. Geological Survey party and will continue his work on the physiography of the San Juan region. Dr. Kirtley E. Mather is to be associated with him in the Government work.

Mr. O. E. Baker of the Office of Farm Management of the Department of Agriculture will this summer be engaged in statistical studies chiefly bearing on the relation of geographic factors to the distribution of crops and farm enterprises in connection with the Atlas of American Agriculture now in preparation.

Professor Harlan H. Barrows of the University of Chicago will be engaged this summer in work for the Illinois Geological Survey.

Mr. E. F. Bean, Chief of Field Parties of the Geological and Natural History Survey of Wisconsin, will be in charge this summer of magnetic exploration in north-central Wisconsin for the Survey.

Professor N. A. Bengtson of the University of Nebraska, in addition to the courses he will give at the summer session of that institution, noted elsewhere, will continue his studies, previously begun under the auspices of the state geological survey, of the Big Blue River valley.

Professor A. P. Brigham of Colgate University will spend the summer after August 1 at Highland Light, Cape Cod, where he will devote some attention to the geographic problems of the Cape.

Mr. Wilbur G. Burroughs will give courses in geography, physiography, and geology at the Chautauqua Summer Schools, Chautauqua, N. Y., during the summer.

Professor Frank Carney of Denison University, whose courses at the summer school of that institution are noted elsewhere, will also be engaged in the preparation of a report for the Ohio Geological Survey.

Professor James F. Chamberlain of the California State Normal School at Los Angeles expects to attend the meeting of the National Educational Association in New York City, July 3 to 8. Later in the summer he plans to do some field work in California.

Professor Frederic E. Clements of the University of Minnesota expects to spend the early summer in ecological work in the badlands of northwestern Nebraska, in the big badlands of South Dakota, and the badlands of the Little Missouri in North Dakota. Later he will spend a month at the alpine laboratory of the university's Department of Botany on Pike's Peak engaged in the spectrophotometric measurement of light. Professor Clements then plans to attend the meetings of the Pacific Division of the American Association for the Advancement of Science at San Diego, August 8 to 10, where he will give a paper on plant succession in badlands. After the meeting he will return through Arizona and New Mexico, spending a month or more in the Cretaceous and Triassic badlands. He hopes this work will complete his badland studies of the past two summers to such a degree that it will prove possible to publish during the coming winter a book on badland vegetation which he has under preparation.

Professor Collier Cobb of the University of North Carolina expects to spend the summer in a study of the coast line from Cape Hatteras southward to Cape Sable with special reference to the coast people.

Mr. N. H. Darton of the U. S. Geological Survey has recently returned from a trip to Cuba where he went to investigate prospects for artesian water. Many facts were obtained as to the geology and physiographic development of the Guantanamo basin.

Professor W. M. Davis is at present engaged in preparing a report on his journey to the Pacific in 1914.

Professor Charles R. Dryer expects to spend a large part of the summer in making a field survey of the physical, economic, and human geography of the state of Indiana in this, the centennial year of her age.

Professor B. K. Emerson of Amherst College expects to spend the summer in geological work in central Massachusetts and southern New Hampshire.

Professor B. E. Fernow of the University of Toronto will, as a member of the Forestry Committee of the Commission of Conservation of Canada, participate in the work of that organization in the study of the forest resources of British Columbia, which it is hoped to complete this year. The results will be in part embodied on a map showing the distribution and quantity of commercial material, which, it is expected, will be published before the end of the year.

Professor Elizabeth F. Fisher of Wellesley College will conduct a geographical excursion to the National Parks of the Rocky Mountains. The party will leave Boston on July 3 and return to Boston on August 4. The route will include Niagara Falls, Yellowstone National Park, Glacier National Park, the Arrowhead Lakes, the Kootenay country, and the Canadian Rockies.

Major General A. W. Greely is employing his leisure time at his country home at Center Conway, N. H., in writing on Alaska and on Polar exploration.

Dr. Robert F. Griggs of Ohio State University will, with the aid of a grant from the National Geographic Society, continue this summer his researches in the Katmai district of Alaska. He hopes to explore the hitherto unvisited volcanoes of the district but will devote his attention primarily to a study of the revegetation of the region devastated by the great eruption of Mt. Katmai in 1912. Doctor Griggs, it will be recalled, contributed an article on "The Effect of the Eruption of Katmai on Land Vegetation" to the *Bulletin of the American Geographical Society*, Vol. 47, 1915, pp. 193–203.

Professor J. W. Harshberger of the University of Pennsylvania will give a course on systematic and field botany and one on advanced botany at the summer session of the Biological Laboratory of the Brooklyn Institute of Arts and Sciences at Cold Spring Harbor from July 5 to August 16. The first course will make the students familiar with the phytogeographical regions of Long Island: the sea beach and sand dune flora of the southern coast, the pine barren region of the central part of the island, the natural prairie of Hempstead Plain, the lake vegetation of Lake Ronkonkoma,

the deciduous forest of the great terminal moraine, and the salt marshes and submerged sea gardens in the immediate vicinity of Cold Spring Harbor.

Dr. Ellsworth Huntington has just completed an investigation of the causes of storms and peculiar seasons such as the spring of 1916. Another piece of research which Doctor Huntington has been carrying on for the past fifteen months is also just terminated. It relates to the physical strength and mental activity of negro boys and girls at Hampton Institute. Daily tests of ten boys and ten girls were made. Although the tests were undertaken for geographical purposes they probably represent a longer and less interrupted series of tests than have ever been made on so large a number of persons for psychological purposes. Doctor Huntington expects to devote a good part of the summer to working up the results.

Dr. Wellington D. Jones of the Department of Geography of the University of Chicago is to spend six months in eastern Asia studying the geography of Japan, Korea, Manchuria, northern and central China. Doctor Jones will return to Chicago about January 1.

Mr. Leonard O. Packard of the Boston Normal School intends this summer to continue his study of the causes of the changes of population in New England.

Mr. P. Lee Phillips, Chief of the Division of Maps and Charts of the Library of Congress, has just completed a monograph on "The Rare Map of the Northwest by John Fitch, Inventor of the Steamboat." In addition, he has two monographs in manuscript: one on John With's first map of Virginia, 1585, and another on Captain John Smith's map of Virginia, 1607. Mr. Phillips has also recently completed a descriptive list of maps of California and San Francisco to 1865 inclusive and an extensive descriptive list of maps and views of the city of Washington, with a supplement relating to Mount Vernon. These two publications are in the hands of the Librarian of Congress on approval with a view to their publication. Mr. Phillips is also getting ready for the press a work on which he has been engaged for some twenty years, which is to be entitled "A Descriptive List of Books and Magazine Articles Relating to Maps, Map-makers and Views." A small pamphlet has recently appeared from his pen and is now ready for distribution, "Notes on the Cataloging, Care, and Classification of Maps and Atlases, Including a List of Publications Compiled in the Division of Maps and Charts."

Mr. J. W. Redway, the author of well-known geographical text-books, is preparing a revised edition of his "Commercial Geography" and has in hand a new text-book on the economic geography of the United States. In addition, he is now engaged in a study of atmospheric dust indoors and out-of-doors, a subject on which he has already published several papers.

Dr. John L. Rich of the Geological Department of the University of Illinois will spend the summer in a study of the glacial geology of the Catskill Mountains under the auspices of the New York State Geological Survey.

Professor V. E. Shelford of the University of Chicago will give a course of lectures and seminars on the dynamics of animal growth, with particular reference to climate, at the Graduate School of Agriculture at Amherst, Mass., during the first week of July and will devote the chief part of the summer to teaching animal ecology in the summer session of the University of Illinois, as noted elsewhere, and investigating the relation of weather to the development of pest insects for the Illinois State Laboratory of Natural History.

Professor J. Russell Smith of the University of Pennsylvania will be engaged this summer in preparing a volume setting forth the results of his investigations to date on the question of conservation and agricultural extension through tree-crop agriculture.

Mr. Eugene Van Cleef of the State Normal School of Duluth, Minn., intends this summer to continue his studies of the frost problem as affecting the Duluth region. Heretofore frost prevention has been studied in that part of the state with respect to extensive crops. Indications are that during the next few years dairying and truck gardening for the individual farmer's use will be substituted. Hence the problem now primarily concerns itself with frost prevention where intensive agriculture is practiced.

Dr. T. Wayland Vaughan of the U. S. Geological Survey has completed the following three papers which have just been transmitted for publication by the Carnegie Institution as parts of its *Publication No. 213:* "Some Shoal-Water Corals from Murray Island, Australia, Cocos-Keeling Islands, and Fanning Island"; "Some Shoal-Water Marine Bottom Samples from Murray Island, Australia, and Comparisons of Them with Samples from Florida and the Bahamas" (in collaboration with Joseph A.

Cushman, Marcus Isaac Goldman, Marshall A. Howe, and others); ''Temperature of the Florida Coral Reef Tract.'' Doctor Vaughan has also just finished two other papers which are of interest from the standpoint of zoögeographic distribution: ''Some Corals from the Kermadec Islands,'' to be published in New Zealand, and ''The Reef-Coral Fauna of Carrizo Creek, San Diego County, California.'' The last-mentioned paper is of special interest as in it he shows that in probably Pliocene time the Atlantic coral fauna extended into the head of the Gulf of California, but that no trace of any coral fauna of the Atlantic facies of a more recent age than Pliocene has yet been found on the Pacific side of the continent. It is known that the Oligocene coral faunas of the West Indies and the southern United States contain numerous corals of Pacific facies, but these no longer exist in the Atlantic Ocean.

Professor Robert DeC. Ward of Harvard University plans to spend the summer at Chocorua, N. H., engaged in work on his ''Climatology of the United States.''

Mr. Raphael Zon, Chief of Forest Investigations of the U. S. Forest Service, is planning to complete this summer the phytogeographic map of the United States on which he has been engaged in collaboration with Dr. H. L. Shantz. In addition, he will be engaged in field work in the Priest River (Idaho), Wind River (Oregon), and Feather River (California) forest reserves and the chaparral regions of southern California. This work will include the study of forest types in relation to climate and soil moisture and soil temperature.

GEOGRAPHICAL PUBLICATIONS

(Reviews and Titles of Books, Papers and Maps.)

Explanatory Note

Nature of Publications. The publications listed in this department necessarily cannot all be distinctively geographical in treatment, but they are all chosen for their geographical interest or because they contain material for the geographer. They consist of (a) books or other extensive publications; (b) articles or papers appearing in periodicals; and (c) maps.

Method of Listing: (a) *Form of Entry.* Notice may be taken of them either in the form of a review, brief comment, or title entry only. Within each unit of the classification used the sequence is as follows: (1) reviews of books, papers, and maps; (2) titles of books and papers; (3) titles of maps. The items of each group are listed alphabetically according to author or, where anonymous, acocrding to the characteristic word of the title. Groups (2) and (3), while mainly consisting of titles only, are occasionally supplemented by short comment. The map titles constituting group (3) are distinguished by italic type from the titles of text publications. The size of books is given in inches to the nearest half inch, the height being given first.

(b) *Classification.* The publications listed each month are classified according to the system outlined below. It is divided into two major divisions: (1) regional geography and (2) general geography. Under the first are included all publications dealing with a definite region, whatever may be the phase of its geography of which they treat; under the second, all publications dealing with the principles of geography and not with their application to definite regions. In other words, the regional takes precedence over the general classification. A paper on the climate of Brazil should be looked for under Brazil and not under "Meteorology and Climatology." Readers desiring to look up all the publications, including the regional ones, which deal with a general phenomenon, are referred to the semi-annual index, where under the specific headings such as "physiography," "earthquakes," "climatology," etc., they will find the titles in question.

In the following classification the regions of the earth are taken up first and the subdivisions of general geography last—although the inverted order would be more logical—because of the greater general interest in this phase of geography and the greater number of publications dealing with it.

About fifty regional divisions have been established. In so doing, the thought has been to create divisions that are broadly homogeneous and to adjust the size of each division to its importance in geographical literature. In some cases this has led to the grouping of several countries together; in others to the retention of a single country as a division by itself; and in still others, as in the case of the United States and Canada, for obvious reasons, to the subdivision of a country into smaller units. Although political areas have on the whole been the units used, in some cases, as for Africa and India, it has been necessary partly to disregard these in order not to break up related regions. The divisions are enumerated as far as possible in their natural order, beginning with the western hemisphere, so that contiguous areas may follow one another.

The regional divisions are shown on the adjoining map of the world in two hemispheres, on which the numbers correspond with those in the synopsis. The boundaries on the map refer only to the land areas which they enclose. Areas included in a division but not expressed in the heading used for it, such as detached islands, are indicated in the explanatory column of the synopsis.

The classification of general geography aims to subdivide its main divisions into their constituent parts. The subjects included under the headings used will likewise appear from the explanatory column of the synopsis.

All publications are classified according to the division with which they predominantly deal. A map of Europe and the Near East would thus be listed under "Europe;" a paper on the climatic basis of vegetational distribution, under "Phytogeography and Zoögeography."

All divisions of the classification are not necessarily represented in each issue.

Synopsis of Classification

Regional Geography

Titles of Headings	*Other Areas Included*
North America	
General	
1 Alaska	
Canada	
General	
2 Yukon, Northwest Territories, British Columbia	Southampton I., Coats I.
3 Alberta, Saskatchewan, Manitoba	
4 Ontario, Quebec	Labrador coast, Mansel I.
5 Maritime Provinces, Newfoundland	

Titles of Headings	*Other Areas Included*
NORTH AMERICA (continued)	
United States	
General	
6 North Atlantic States	
7 South Atlantic States	
8 North-Central States	
9 South-Central States	
10 Western States	
11 Mexico and Central America	Panama; Gaudalupe I., Revilla Gigedo Is., Clipperton I.
12 West Indies	Bermuda; Curaçao, Aruba, Buenayre, Trinidad, but not Venezuelan coastal islands

Titles of Headings	*Other Areas Included*
SOUTH AMERICA	
General	
13 The Guianas, Venezuela, Colombia	Cocos I., Malpelo I.
14 Ecuador, Peru, Bolivia	Galápagos Is.
15 Brazil	Fernando Noronha I., St. Paul I., Trinidad I.
16 Paraguay, Uruguay, Argentina, Chile	San Ambrosio I., Juan Fernandez I., Falkland Is.
EUROPE	
General	
17 British Isles	Channel Is.
18 The Low Countries, Luxemburg	
19 France	
20 Switzerland, or the Alps	
21 Germany	
22 Scandinavia, including Finland	Iceland, Faroe Is.
23 Russia	
24 Austria-Hungary	
25 Balkan States, including Rumania	
26 Italy	Malta
27 Spain, Portugal	Azores
AFRICA	
General	
28 Atlas Region	Madeira, Canary Is.
29 Sahara, including Egypt	
30 Sudan and Upper Guinea	Cape Verde Is., Fernando Po
31 Congo Basin and Lower Guinea	S. Thomé and Principe Is., Annobon I.
32 East Africa	Socotra I.
33 South Africa	Ascension I., St. Helena, Tristan da Cunha, Gough I.
34 Madagascar and Adjacent Islands	Comoro Is., Amirante Is., Seychelles Is., Mascarene Is.
ASIA	
General	
35 Turkey in Asia, Arabia, Caucasia, Iran	Cyprus (Iran=Persia, Afghanistan, Baluchistan)
36 Russian Central Asia	=General Government of the Steppes, General Government Turkestan, Bokhara, Khiva
37 Siberia	
38 Manchuria, Korea, Japan	
39 Mongolia, Chinese Turkestan, Tibet	
40 China	
41 India	Ceylon, Laccadive Is., Maldive Is., Chagos Is.
42 Farther India, including Burma	Andaman Is., Nicobar Is.
43 Malay Archipelago, including the Philippines	Cocos Is.
AUSTRALASIA AND OCEANIA	
General	
44 Australia, New Zealand	Norfolk I., Lord Howe I., Chatham Is., Bounty Is., Antipodes Is., Auckland Is., Campbell I.
45 Melanesia, Micronesia, Polynesia	
POLAR REGIONS	
General	
46 Arctic	American Arctic Archipelago
47 Antarctic	Amsterdam I., St. Paul I., Kerguelen I., Heard I., Crozet Is., Prince Edward Is., Bouvet I., South Georgia, Sandwich Is., Dougherty I., Macquarie I.
OCEANS	
WORLD AS A WHOLE AND LARGER PARTS	

General Geography

Titles of Headings	*Subjects Included*
MATHEMATICAL GEOGRAPHY	
General	
Astronomical Geography	Orientation on the celestial sphere; rotation and revolution; time
Surveying and Geodesy	Navigation; size and shape of the earth
Cartography	Projections; map content; cartometry; globes and relief models
PHYSICAL GEOGRAPHY	
General	
Geophysics	Density; condition of the interior; determination of gravity; terrestrial magnetism; atmospheric electricity
Geology and Geomorphology	Seismology
Hydrography and Oceanography	Potamology; limnology
Meteorology and Climatology	Phenology; aërology
Phytogeography and Zoögeography	
HUMAN GEOGRAPHY	
General	
Anthropology and Ethnology	
Anthropogeography	Population and population density; history of settlement; city geography
Economic Geography	
General	
Production	Natural products; agriculture; forestry
Distribution	Commerce; transportation
HISTORY OF GEOGRAPHY AND EXPLORATION	Biographies; historical geography
EDUCATIONAL GEOGRAPHY	Methodology

NORTH AMERICA

UNITED STATES

General

FONKALSRUD, A. O., with the collaboration of BEATRICE STEVENSON. **The Scandinavian-American.** 167 pp. K. C. Holter Publ. Co., Minneapolis, 1915. 75 cents. 7 x 5.

While discussion is raging around the hyphen, it is of value to get a book that sets forth soberly and with knowledge the history and achievements of one of our alien groups. What has it contributed to American life? Has it assimilated rapidly, and has assimilation been good for it? The present book does not answer these questions as fully and clearly for the Scandinavian group as we might wish, yet it marks a distinct contribution. By far the most valuable chapters are those dealing with the great Northwest, which is treated with first-hand knowledge and critical insight. The total number of Scandinavians in the states of Illinois, Michigan, Minnesota, Wisconsin, Iowa, the Dakotas, and Nebraska was, in 1910, 756,047, or 60.04 per cent of all the Scandinavians in the United States. This included only the first generation, and as many of the settlements are comparatively old, there must be added the children and childrens' children. Minnesota touched the high-water mark in 1900, when 43 per cent of the population of the state was Scandinavian.

The authors pay tribute to the toil of the early pioneers, which has won for them the wide acres of the Northwest, including almost the whole of the Red River Valley, "the bread basket of the world." This very toil has precluded any ardent pursuit of culture on the part of the first generation. In fact, the Scandinavian tends to become Americanized before he has time to set the mark of his native traditions upon American life. His adaptability, his affinity with the American type, and his self-distrust in a great, strange country all combine to make an American of him as fast as possible. The

second and third generation, on the other hand, have consciously taken up the study of Northern languages, literature, and music as a part of their intellectual equipment. In politics the Scandinavian make but a fair showing; although Minnesota has had four Scandinavian governors, the number of Scandinavian office-holders is not in proportion to their number. It is the church with its schools and benevolent institutions that constitutes the greatest social contribution of the Scandinavian immigrants, and through it a valuable element of stability has entered their lives. HANNA ASTRUP LARSEN.

CAMPBELL, M. R., AND F. R. CLARK. **Analyses of coal samples from various parts of the United States.** *U. S. Geol. Surv. Bull. 621-P*, pp. 251-370. Washington, 1916.

—— **Climatological data for the U. S. by sections, February, 1916 (Vol. 3, No. 2).** Maps. *U. S. Weather Bur. [Publ.] No. 574.*

DORRANCE, J. G. **Shipbuilding resuming its old-time importance in American commerce and industry: Activity of our shipyards since the outbreak of the European War.** Ills. *Scientific American*, 1916, May 27, pp. 550-551.

—— **Fog, Annual hours of, 1885-1915.** *Monthly Weather Rev.*, Vol. 44, 1916, No. 1, pp. 21-22. [Reprinted from *Lighthouse Service Bull.*, Dec., 1915, No. 48, p. 194. Data deal with Atlantic and Pacific coasts and Great Lakes.]

GERSON, OSCAR. **Our colonial history from the discovery of America to the close of the Revolution: Grades 5A-5B, New York City edition.** 195 pp.; maps, ills., index. Hinds, Noble & Eldredge, New York, 1915. 38 cents. 8 x 6.

GROVER, N. C., C. C. COVERT, AND G. C. STEVENS. **Surface water supply of the United States, 1913. Part 1: North Atlantic coast basins.** 189 pp. Ills. *U. S. Geol. Surv. Water-Supply Paper 351.* Washington, 1915.

HENRY, A. J. **Floods of January-February, 1916, in the lower Mississippi and in southern California.** *Monthly Weather Rev.*, Vol. 44, 1916, No. 1, pp. 28-38.

—— **Indian Affairs, Report of the Commissioner of, to the Secretary of the Interior for the fiscal year ended June 30, 1915.** 219 pp.; map. Dept. of the Interior, Washington, 1915. [Accompanied by a map, 1:8,200,000, showing Indian reservations in 1915. Although not its primary purpose, it is also helpful in showing the main railroads of the country.]

KEMP, J. F. **Buried river channels of the northeastern states.** Map, diagrs., ills. *Proc. and Coll. of the Wyoming Hist. and Geol. Soc.*, Vol. 14, 1915, pp. 35-54. Wilkes-Barre, Pa.

LANE, F. K. **The nation's pride.** Diagrs., ills. *Natl. Geogr. Mag.*, Vol. 28, 1915, No. 6, pp. 589-606. [A survey of our national resources and opportunities, abstracted by Franklin K. Lane, Secretary of the Interior, from his report to the President for 1915.]

MAC COUN, TOWNSEND. **An historical geography of the United States.** 47 map plates with 46 pp. of explanatory text; index. Silver, Burdett & Co., New York, Boston, Chicago [1911]. 90 cents. 7½ x 6. [The province of historical geography, according to the preface, "is to draw a map of a country as it appeared after each of the different changes it has gone through, and then point out the historical causes which have led to the changes on the map." The first function of this definition is performed by a set of nearly fifty maps; the second, by an explanatory text. The maps, which are poor in technical execution, give a comprehensive survey of the territorial changes in American history. They are solely political and do not touch upon past economic conditions—a field so fruitfully cultivated by the modern historical school, which appreciates the importance of geographic influences.]

MCSWEENEY, E. F. **The problems of port development.** 29 pp. Wright & Potter Printing Co., Boston, 1915. [The specific title of the main part of the article, which was delivered as an address at the Fourth Annual Convention of the American Association of Port Authorities at Los Angeles, Cal., Sept. 13-15, 1915, is "Public Control of Our Water-Fronts and the Obstacles To Be Overcome." The author is chairman of the Directors of the Port of Boston.]

MATTHES, F. E. **The conference on the delineation of physiographic provinces in the United States.** *Annals Assoc. Amer. Geogrs.*, Vol. 5, 1915, pp. 127-129. [Abstracted in the May *Review*, pp. 372-373.]

NORTON, T. H. **The potash famine: Its magnitude and effects, and remedies promised for the future.** Diagrs. *Scientific American*, 1916, Feb. 5, pp. 146 and 163-164.

—— **Physician, The, and the Weather Bureau.** Map. *Monthly Weather Rev.*,

Vol. 44, 1916, No. 1, pp. 22-23. [Abstracted from a paper with this title by Ford A. Carpenter, *Journ. Amer. Medical Assoc.*, Chicago, Vol. 66, 1916, pp. 6-11.]

SHERRILL, C. H. **French memories of eighteenth-century America.** viii and 335 pp., ills., bibliogr. Charles Scribner's Sons, New York, 1915. $2. 8½ x 6. [A mosaic of the Revolutionary period of our country, put together from the writings of the French men and women who came to this country during those years as soldiers, diplomats, scientists, financiers, or business men. There are chapters on labor, manufacturers, commerce, foreign trade, and the Allied armies. The method followed is to quote in full the exact words of the writers cited and to connect the whole narrative by a discriminating, explanatory text.—D. H. B.]

SKELLY, J. W. **Mississippi River stages, 1915, and hydrograph, 1861-1914.** *Engineering News*, Vol. 75, 1916, No. 8, pp. 350-351.

SMITH, G. O. **The people's interest in water-power resources** (Contributions to the Hydrology of the United States, 1916). *U. S. Geol. Surv. Water-Supply Paper 400-A*, pp. 1-8. Washington, 1916. [Paper read at the Second Pan-American Scientific Congress, Washington, Dec., 1915-Jan., 1916.]

SORRELL, L. C. **Dislocations in the foreign trade of the United States resulting from the European War.** Diagrs. *Journ. Political Econ.*, Vol. 24, 1916, No. 1, pp. 25-75. Chicago.

North-Central States

—— **Erie-Michigan waterway.** Map. *Bull. Atlantic Deeper Waterways Assoc.*, Vol. 8, 1915, No. 1, pp. 10-11. [Proposed waterway from Buffalo to Chicago via Lake Erie, Maumee River to Fort Wayne, and thence via canal to Lake Michigan.]

GRINNELL, G. B. **The fighting Cheyennes.** ix and 431 pp.; maps, diagrs., index. Charles Scribner's Sons, New York, 1915. $3.50. 9 x 6. [Deals with the wars of the Cheyennes both from the white man's and the Indian's point of view. Besides the battle plans there are a number of well-drawn outline maps of the central Great Plains showing the trails and settlements at various periods (e. g., 1850-60, 1864-65).]

HANKINSON, T. L. **Notes on birds of regions with primitive prairie conditions.** *Wilson Bull.*, Vol. 28, 1916, No. 1, pp. 5-11. Wilson Ornithological Club, Chicago.

HOTCHKISS, W. O., assisted by E. F. BEAN, and O. W. WHEELWRIGHT. **Mineral land classification, showing indications of iron formation in parts of Ashland, Bayfield, Washburn, Sawyer, Price, Oneida, Forest, Rusk, Barron, and Chippewa Counties [Wisconsin].** viii and 378 pp.; maps, diagrs., ills., index. *Wisconsin Geol. and Nat. Hist. Surv. Bull. No. 44: Econ. Ser. No. 19.* Madison, 1915. [A survey of an area in northwestern Wisconsin forming part of the general Lake Superior iron district. There is a general geologic map on the scale of 1:380,160, besides numerous detailed maps of townships.]

LEONARD, A. G. **The lignite deposits of North Dakota.** Ills. *Quart. Journ. Univ. of North Dakota*, Vol. 6, 1916, No. 3, pp. 234-240.

MOODY, F. B. **Protection of beaver in Wisconsin.** Ills. *Amer. Forestry*, No. 268, Vol. 22, 1916, pp. 220-224. [The beaver as a preventive agency against forest fires.]

O'HARRA, C. C. **An early magazine article on the Black Hills.** Ills. *Pahasapa Quart.*, Vol. 5, 1916, No. 4, pp. 11-15. South Dakota School of Mines, Rapid City, S. D. [Reference is to an article by Leander P. Richardson published in *Scribner's Monthly* for April, 1877.]

SIEBENTHAL, C. E. **Origin of the zinc and lead deposits of the Joplin region, Missouri, Kansas, and Oklahoma.** 283 pp.; maps, diagrs., ills., index. *U. S. Geol. Surv. Bull. 606.* Washington, 1915. [Contains an expressive generalized topographic map of the Ozark uplift.]

STRATTON, J. H. **The development of ore unloading on the Great Lakes.** Diagrs., ills., bibliogr. *Journ. of Cleveland Engin. Soc.*, Vol. 6, 1913, No. 1, pp. 3-26. Cleveland, O.

—— ***Edgington, Illinois–Iowa, sheet.*** [***Topographic map of the United States.***] 1:62,500. Surveyed in 1913; edition of 1916. U. S. Geological Survey, Washington, D. C. [A mature, strongly braided river (the Mississippi) traversing a submaturely dissected plain. Note that the forests are largely confined to the valleys, and that the people live almost wholly on the flat, open uplands. Compare with conditions in the mature plateau of West Virginia (Logan sheet), the folded Appalachian Mountains of

Pennsylvania (New Bloomfield sheet), or the glaciated mountains of Maine (Bethel sheet), where the inaccessible, rugged uplands are forested and the population dwells in the cleared valley bottoms.—D. W. J.]

—— ***Aitkin, Minnesota, sheet.*** [*Topographic map of the United States.*] 1:62,500. Surveyed in 1914; edition of 1915. U. S. Geological Survey, Washington, D. C. [A typical portion of the glaciated plain of central Minnesota through which the Mississippi River pursues a meandering course over a marshy flat between two morainic belts.

FIG. 1—Meanders in the upper Mississippi from the Aitkin, Minn., topographic sheet.

The accompanying sketch from the center of the sheet shows that not even the lower Mississippi can surpass this small headwater branch in the intricacy of its meander pattern. The Aitken sheet will be serviceable to teachers who desire to illustrate all stages of meander and oxbow lake formation.—D. W. J.]

SOUTH AMERICA

The Guianas, Venezuela, Colombia

SCHULLER, RUDOLF. **The Ordáz and Dortal expeditions in search of El-Dorado as described on sixteenth-century maps.** 15 pp.; maps, bibliogr. *Smithsonian Micellaneous Collections,* Vol. 66, 1916, No. 4.

The first of the two maps described is Oviedo's "Huyapari" (Orinoco) map contained in the second volume of his "Historia General y Natural de las Indias" (Imprenta de la Real Audiencia de la Historia, Madrid, 1852). The map is undated, but internal evidence makes it certain that it was not drawn before 1542. Its legends include references to the expeditions of Diego de Ordáz (1532), Herrera (1535), and those of Dortal (1536 and 1540). The second is an anonymous map bearing the title "Mapa de los rios Amazonas, Esequibo ó Dulce y Orinoco y de las comarcas adyacentes." The date 1560, ascribed to it by the editors of the British Guiana Boundary Arbitration (Venezuela: Atlas, Pl. 76, Baltimore, 1898) has been generally accepted. In addition to legends relative to the Ordáz expedition, it notes that of Orellana and the Portuguese colonizing expedition commanded by Luis de Mello, 1554.

—— **British Guiana: Report for 1914-15.** 28 pp.; map. *Ann. Colonial Repts. No. 874.* London, 1916.

Ducke, A. **La région des rapides de Cupati (extrême sud-est de Colombie).** *La Géogr.,* Vol. 30, 1914-15, No. 5, pp. 365-372. Paris.

Fowler, Frank. **Report on the Lands and Mines Department, British Guiana, for the year 1914-1915.** xii and 28 pp. Georgetown, Demerara, 1915.

McKirahan, Samuel. **Mining in Surinam (Dutch Guiana).** *Pahasapa Quart.,* Vol. 5, 1916, No. 3, pp. 26-29. South Dakota School of Mines, Rapid City, S. D.

Brazil

Magalhães, Basilio de. **Expansão geographica do Brasil até fins do seculo XVII.** 147 pp.; bibliogr. Imprensa Nacional, Rio de Janeiro, 1915. 9½ x 6½.

The well-known Brazilian writer, Dr. Basilio de Magalhães, presented under the above-quoted title a large and ably written memoir to the First Congress of National History held at Rio de Janeiro in 1914 under the auspices of the Geographical and Historical Institute of Brazil. It reviews the progress of geography made in Brazil since its discovery up to the close of the seventeenth century, with many interesting and useful details and critical notes concerning this important theme.

The whole work is divided into several chapters, each of them corresponding to the respective principal period of geographical development, with a detailed account and analysis of the main factors which in the opinion of the author have contributed directly and indirectly to the geographic and cartographic progress of Brazil. The first chapter relates to the demarcation line which, according to the treaty of Tordesillas (1494), should have been the official border of the Spanish and Portuguese discoveries in the New World. In such a summary it is, of course, impossible to clear up the extremely complex questions, historical as well as geographical (cartographical), related to the imaginary border established by the Pope Borgia.

In the following chapter, which is one of the most interesting of the whole memoir, the author reviews the different exploring expeditions carried out mostly by Portuguese adventurers into the unknown interior of Brazil during the years 1504 to 1696. The next chapter, not less interesting and important than the former, and called by the writer the "cycle of the spontaneous development of Brazilian geography" embraces a very able résumé of the numerous expeditions undertaken by Portuguese fortune hunters, from 1526 to 1700. The enterprises of these *unofficial* explorers—the real geographers of the period—had ordinarily two objects: first, the discovery of the fabulous gold and silver mines of whose alleged existence the Portuguese settlers were chiefly informed by their Indian associates; and, second, and almost as lucrative as the first, the enslavement of poor and defenceless native Indians. They were generally surprised at night; the men of the tribe were killed if they resisted; and the rest enslaved. The old people, unable to render personal service to the invaders, and a burden to them during the long and perilous journey homewards, were mercilessly killed. Entirely new is the study of the influence upon earlier geographic progress in Brazil of the breeding of cattle, to which undoubtedly is due the discovery of the so-called *campos* in the southern and western regions. Finally, the author analyzes, yet too briefly, the geographical work done by the members of the different Catholic orders which in the past centuries were established among the native Indians of Brazil.

The "appendix" contains a bibliographical list consisting mostly of Brazilian literature.

R. Schuller.

—— **Brazil and meat production.** *South Amer. Journ.,* Vol. 80, 1916, No. 12, pp. 235-237. [Brazil, now occupying third place among the cattle-producing countries of the world, is fast developing her export trade in meat. During the first nine months of 1915, over 3,000,000 kilograms of frozen meat were shipped from Santos, where the most notable increase is reported.]

—— **Brazilian commerce in 1915.** *South Amer. Journ.,* Vol. 80, 1916, No. 13, pp. 255-256.

Keiser, R. L. **Rio Grande do Sul.** 11 pp. *Suppl. to Commerce Repts.,* Ann. Series, 1916, No. 40a. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

Lawrence, F. E. **Brazilian opportunities and the Brazil Railway.** Map, ills. *Engineering News,* Vol. 75, 1916, No. 8, pp. 345-350.

Morize, H. **Sur le champ électrique de l'atmosphère à Rio de Janeiro.** Diagrs. *Terrestrial Magnetism and Atmospheric Electricity,* Vol. 20, 1915, No. 4, pp. 175-181.

—— **Paraná, The state of.** *South Amer. Journ.*, Vol. 80, 1916, No. 11, pp. 215-216. [Paraná possesses a wealth of pastoral and forestal resources, but at present the only staple production is maté. Maté accounts for over 85 per cent of the exports, and the output has been still further stimulated by satisfactory arrangements between Brazil and Argentina in regard to the latter's import trade.]

EUROPE

British Isles

Stone, Gilbert. **Wales: Her origins, struggles and later history, institutions and manners.** xxxvi and 455 pp. F. A. Stokes Co., New York, 1915. $2.50. 9 x 6.

A more suitable title would be "The Welsh," for the volume has to do little with the land, much with the people. Indeed it is not a work for the geographer, as a geographer, inasmuch as it is occupied wholly with details of the archaeology and history of the Welsh folk. It is indeed richly illustrated, but, here again, the dozens of full-page plates exhibit landscapes a few, castles several, and a profusion of arrows, utensils, vases, shields, statues, monuments, seals, mounds, and sepulchers. The frontispiece, a symbolic picture of a venerable bard with his lyre among impressionistic Welsh crags, fitly begins a book which sets out in the dim spaces of Neolithic time and passes by stepping stones of relic and tradition, through eras of Druid, Brython, Roman, and Anglo-Saxon to the modern principality.

There is not even a map of modern Wales, the least antique item in the meager outfit of four maps being an outline sketch showing the location of the very numerous castles. All in all, however, the volume is interestingly written, well and handsomely made and bids effectually for the attention of all who would know more of the beginnings and ongoing of this fascinating, rather clannish, highly imaginative, and close-knit branch of Britain's population. Albert Perry Brigham.

Fleming, Rufus. **Edinburgh.** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 19b, pp. 1-8. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

Hooper, John. **Periodic migrations of Irish agricultural labourers.** *Monthly Bull. of Econ. and Social Intelligence*, Vol. 60, 6th year, 1915, No. 12, pp. 105-114. Internatl. Inst. of Agric., Rome.

Horne, Dr. **The water-bearing strata of the city of Edinburgh.** Map, diagrs. *Trans. of the Edinburgh Geol. Soc.*, Vol. 10, 1914, Part 2, pp. 97-109.

Morris, A. **Merionethshire.** (Series: Cambridge County Geographies.) ix and 160 pp.; maps, diagrs., ills. The University Press, Cambridge (G. P. Putnam's Sons, Amer. Agents), 1913. 7½ x 5.

Muir, T. S. **East Lothian.** (Series: Cambridge County Geographies.) viii and 117 pp.; maps, diagrs., ills. The University Press (G. P. Putnam's Sons, Amer. Agents), Cambridge, 1915. 7½ x 5.

Skinner, R. P. **United Kingdom.** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 19a, pp. 1-11. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

Slater, Gilbert. **The making of modern England.** (New revised edition.) With a prefatory note by J. T. Shotwell. xli and 308 pp. Diagrs., index, bibliogr. Houghton Mifflin Co., Boston [1915]. 8 x 5½.

Woodward, H. B. **Notes on the geology of Raasay.** Bibliogr. *Trans. of the Edinburgh Geol. Soc.*, Vol. 10, 1914, Part 2, pp. 164-195. [The island of Raasay lies between Skye and the mainland of Scotland.]

AFRICA

South Africa

Lucas, Charles. **A historical geography of the British colonies: Vol. 4, South Africa,** new edition. **Part I: History to 1895.** viii and 331 pp.; maps, index. **Part II: History to the Union of South Africa.** viii and 533 pp.; maps, index, bibliogr. **Part III: Geographical.** Revised by A. B. Keith. 332 pp.; maps, index. The Clarendon Press, Oxford, 1913, 1915, and 1913. Parts I and III, 9s/9d; Part II, $1.60. 7½ x 5.

These three small volumes, of which the first has already been briefly noticed (*Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, p. 61), give a clear picture of the southern end of

Africa from the earliest visits of European sailors to the present time. Unlike most condensed histories, the story is not dry. There is flesh on the framework, interest in the narrative, and a goodly flavor of philosophy in the treatment.

(1) Early in the seventeenth century the English East India Company dumped at the Cape a certain number of condemned criminals who had been pardoned, "to make discoveries in those places where they should be left." No trace of them was later found, and they probably died at the hands of the Hottentots.

Then the ships of the various companies in the East Indies trade began to stop at Table Bay to deposit letters under stones or in the ground for other vessels to pick up. It was the first post office in South Africa; the half-way house between Europe and the Indies. It was not till the middle of the century that the Dutch East India Company thought it worth while to found a station at Table Bay. This is how the Boers, or Dutch farmers, appeared upon the scene, making much small history through their scrimmages with the natives and enslavement of them and the slow penetration of their little farms into the hinterland. For a century and a half the Boers fought, worked, and trekked in South Africa till finally England took them under her wing as one of the prizes won in war from the Netherlands. Since 1814 the British have been in possession of the southern end of Africa, a period marked by stirring episodes, culminating in the great Boer war (1899-1902), the outcome of which was to add to the British Empire the most of Africa south of the Zambezi. This result was most ably abetted and promoted by that genius, Cecil Rhodes, who had been ably excoriated by the British press for what he had done to bring the war about.

(2) The second volume is given to the history of that war, and it is a graphic and absorbing story. No one, excepting the historian who seeks original sources, need ask for a better account of it than this.

(3) Doctor Keith, in the third volume, shows British South Africa as it is today. What he says of progress there may also be said of some different environments in other parts of Africa. He assures us that in tropical Northern Rhodesia the white death rate does not greatly exceed that in Europe and North America; this is due to advancing knowledge of the requirements of tropical hygiene. The number of white women in Southern Rhodesia is steadily increasing, to the great improvement of social conditions. About 100,000 square miles in that region have a climate in which European children may flourish; and a territory there, larger than New York state, has economic and all other conditions fully suitable for European settlement and enterprise. He adds that the administration of all British South Africa is based on the importance of interfering as little as possible with native organization. CYRUS C. ADAMS.

LIGHTFOOT, B. **The geology of the north-western part of the Wankie coal-field.** Maps, diagrs., ills., bibliogr. *Geol. Surv. of Southern Rhodesia Bull. No. 4,* pp. 3-49. Bulawayo, 1914.

MARAIS, E. N. **Les effets d'une extrême sécheresse dans l'Afrique du Sud.** *Rev. Gén. des Sci.,* Vol. 27, 1916, No. 4, pp. 112-115. [Based on an article in the *Agric. Journ. of the Union of So. Africa.*]

MAUFE, H. B. **The coal resources of Rhodesia.** Map, bibliogr. *Geol. Surv. of Southern Rhodesia Bull. No. 4,* pp. 56-61. Bulawayo, 1914.

McDONALD, D. P. **The study of ore-deposits in South Africa.** *Proc.* (to accompany *Trans.*) *of the Geol. Soc. of South Africa,* Jan. to Dec., 1915, pp. xxi-xxxii.

MELLOR, E. T. **The upper Witwatersrand system.** Map, diagrs. *Trans. of the Geol. Soc. of South Africa,* Vol. 18, 1915, pp. 11-56. [Concludes with a discussion of the conditions of deposition of the system; in particular of the deltaic origin of certain beds.]

PEROLD, A. I. **Viticulture in South Africa.** *Monthly Bull. of Agric. Intelligence and Plant Diseases,* Vol. 7, 1916, No. 1, pp. 1-30. Internatl. Inst. of Agric., Rome.

ROGERS, A. W. **Geitsi Gubib, an old volcano.** Map, diagr. *Trans. Royal Soc. of South Africa,* Vol. 5, 1915, Part 3, pp. 247-258. Cape Town. [(German) Southwest Africa.]

THOMSON, A. R. **The Wankie colliery and method of working the coal.** Diagrs. *Geol. Surv. of Southern Rhodesia Bull. No. 4,* pp. 50-55. Bulawayo, 1914.

ASIA

TURKEY IN ASIA, ARABIA, CAUCASIA, IRAN

BURY, G. W. **Arabia Infelix, or the Turks in Yamen.** x and 213 pp.; maps, ills., index. Macmillan & Co., London, 1915. $1.88. 9 x 5½.

Arabia is still one of the world's least known regions, and anyone who succeeds to

lift the veil of general ignorance a little higher, as the author has done, may lay title to commendable accomplishment. Over ten years' official service in British territory in the southwestern corner of the peninsula have not been spent in vain, in Mr. Bury's case, for his pages teem with first-hand information on the many-sided life of the unfortunate Yamen province which he describes.

He pictures at the very start a province imperfectly held by its Turkish captors, with the natives making no effort to conceal their scorn of the sultan's impotency. His descriptions of the inhabitants will be welcome to anthropologists, in spite of their brevity or attribution to legendary origins. Much in the same way the subject-matter of his chapters bears on geography continually, without fitting, however, in a methodically prepared framework.

Economic questions occupy considerable space. Yamen was evidently once more prosperous, and the implication contained in the title will strike the reader particularly if he should remember that Yamen is, by soil and climate, the most favored province in all Arabia. It is strange to find no reference to the decay of trade in the province as being a cause of the endeavors of Turkish governors to divert the flow of imports and exports to Hodeida from their natural ports in the south on British territory. The moist uplands which form the most productive districts of the vilayet are in reality barred from the sea on the west by parallel coast ranges. The projected Hodeida-Sanaa railway was destined, in the minds of the Turkish rulers, to overcome the natural dependence on the Aden protectorate, besides providing rapid transportation for Turkish regiments.

Frech, F. **Die armenischen Burgen.** Ills. *Zeitschr. Gesell. für Erdkunde zu Berlin,* 1915, No. 9, pp. 576-580.

—— **Strategy of the Great War, The: The road to Egypt and India.** Map, ills. *World's Work,* Vol. 31, 1916, No. 5, pp. 555-569.

Thimm, C. A. **Turkish self-taught, with English phonetic pronunciation.** 4th edit., revised by G. Hagopian (Marlborough's Self-Taught Series). 138 pp. Ills. E. Marlborough & Co., London, 1910. 60 cents. 7½ x 5.

Whiting, J. D. **Jerusalem's locust plague, being a description of the recent locust influx into Palestine, and comparing same with ancient locust invasions as narrated in the Old World's history book, the Bible.** Map, ills. *Natl. Geogr. Mag.,* Vol. 28, 1915, No. 6, pp. 511-550.

HUMAN GEOGRAPHY

Economic Geography

Production

Bengtson, N. A., and Donee Griffith. **The wheat industry.** (The Industrial Series.) xiii and 341 pp.; maps, diagrs., ills., index. The Macmillan Co., New York, 1915. 65 cents. 7½ x 5½.

This is an elementary volume designed, mainly as a reference work, for the upper grades of elementary schools. Two main lines of thought receive emphasis, viz. the process of wheat production and the regional distribution of the cereal. In all there are seventeen chapters, of which seven discuss the processes of production, distribution, and milling, while six relate to the regional distribution of wheat. The book is written in an interesting style, and the text is well illustrated. At the close of the chapters are review questions and exercises, designed to guide the pupils in studying and to form an outline for class room discussions. The volume belongs to the publisher's Industrial Series of which the editor is Dr. G. E. Condra. A. L. Bishop.

Boyer, Jacques. **Le sucre de canne et la guerre.** Ills. *La Nature,* No. 2216, 1916, Mar. 18, pp. 177-181.

Bullock, William. **Timber from the forest to its use in commerce.** (Series: Pitman's Common Commodities of Commerce.) ix and 149 pp. Ills., index. Sir Isaac Pitman & Sons, Ltd., London and New York. 75 cents. 7½ x 5.

Dammer, Bruno, and Oskar Tietze. **Die nutzbaren Mineralien, mit Ausnahme der Erze, Kalisalze, Kohlen und des Petroleums.** Maps, diagrs., ills., index. Vol. 1: xv and 501 pp. Vol. 2: xii and 539 pp. Ferdinand Enke, Stuttgart, 1913-1914. 10 x 6½. [With text-maps showing occurrence of mineral deposits.]

—— **Food prices, Foreign, as affected by the war.** 129 pp. *Bull. U. S. Bur. of Labor Statistics No. 170.* Washington, 1915.

Macfarlane, J. J. **The world's tin.** Ills. *Commerc. America,* Vol. 12, 1916, No. 9, pp. 15, 17, 19, 21, and 23.

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THE BIOGEOGRAPHY OF THE NORTHERN GREAT PLAINS*

By STEPHEN S. VISHER, Ph.D.

The Northern Great Plains region (map, Fig. 1) displays a rather monotonous and uninviting aspect. The characteristic vegetation of millions of acres is short grass, low herbs, and stunted shrubs, nearly all of which appear dead during more than half the year. Animal life, too, is rarely conspicuous and in general seems almost wanting. The signs of human occupation are few and not uncommonly of a doleful sort, unattractive shacks, stunted crops, or poorly constructed barbed-wire fences.

The region is far more attractive to the geographer who appreciates that it contains many evident and important responses to geographic conditions.[1] The fairly high latitude, location to the leeward of a lofty mountain range, the irregular and meager precipitation, and the rather uneventful geologic history of the region combine to produce the more direct influences: the amount of moisture and heat content of the soil, subsoil, and air, the compactness of soil and subsoil, the exposure of the surface to sun and wind, and the drainage. These factors are few in number and fairly uniform over large areas. They have acted as the chief selective agents in barring most of the many species which, for topographic reasons, have found it easy to attempt to establish themselves on the steppe.

Because of the comparatively simple geographic conditions, the paucity of species, the simplicity of structure of the plants, the unusual opportunities for field work and the many striking "adaptations" in plants and animals, this region appears especially suitable for a study in biogeography.

* This study is based on several summers' field work in South Dakota, eastern Montana and Wyoming, North Dakota, and northern Nebraska. The western two-thirds of South Dakota is the area from which most of the data were obtained, but the related biogeographic conditions in neighboring states are also included.

Much of the field work was done under the auspices of the South Dakota Geological and Natural History Survey. The writer wishes also to acknowledge assistance from Professors R. D. Salisbury and Henry C. Cowles, of the University of Chicago, and Victor E. Shelford, of the University of Illinois.

[1] A suggestive general discussion of the environmental reactions, plant, animal, and human, in the Northern Great Plains region, which is, however, not free from errors in generalization, is to be found in Wallace Craig: North Dakota Life, Plant, Animal, and Human, *Bull. Amer. Geogr. Soc.*, Vol. 40, 1908, pp. 321–332 and 401-415. S. S. Visher: Notes on the Significance of the Biota and Biogeography, *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, pp. 509-520, also treats of various environmental reactions in the Northern Great Plains.

General Geographic Conditions of the Steppe

The greater part of the Northern Great Plains is a semi-arid grassland, large areas of which are dominated by short grasses and bunch grasses, and smaller areas by low shrubs. In the following discussion, the term steppe is used for these three semi-arid plant formations, the sub-humid prairie not being included.

The climatic conditions of the Northern Great Plains are severe. The rainfall is irregular in its distribution. It sometimes falls in hard showers and occasionally is accompanied by hail. Slight showers may bring the only precipitation received during long periods. Droughts of shorter (a few weeks) or longer (two or three seasons) duration are not rare. Ordinarily, about four-fifths of the total precipitation (which averages about 15 inches per year) takes place in the five growing months (April to August). The rest of the year is conspicuously dry. The relative humidity of the atmosphere in the steppe is low and the rate of evaporation high. In much of the area, the possible rate of evaporation is from two to five times the average rainfall.

Fig. 1—Sketch-map of the part of the Northern Great Plains especially studied. Scale, 1:9,000,000.

The numerals enclosed in circles correspond to the figure numbers and indicate where the photographs were taken.

The extreme yearly range of temperature is almost 150° F., and the daily range frequently 50°. The seasons are irregular as to time of occurrence, and summer maxima of 100° and winter minima of —40° are not rare. Freezes which terminate most of the vegetative activity sometimes occur as early as mid-September and as late as May, and less severe frosts as early as the beginning of September and as late as early June.

The wind velocities are seldom high, but an 8 to 12 mile breeze is almost constant during the daytime. In the summer, such winds may be exceedingly hot and, if the air is very dry, may wither the vegetation. When driving dry snow the high winds of winter are peculiarly severe.

There is little protection from the heat of the sun for the plants or for

non-burrowing animals, except those which can be sheltered by low shrubs, which are rarely dense, the larger herbs, and the very low cliffs ("cut banks") which are found here and there along the valleys. Dark, cloudy days are infrequent. With respect to conditions of light the steppe approaches the desert.

The More Conspicuous Plants and Animals[2]

While the intimate relations of the plant and animal populations of the Northern Great Plains to the physical conditions of the region are the chief theme of this paper it is necessary to introduce the main topic by a few summary paragraphs which list the characteristic forms of life in each group.

PLANTS[3]

The predominant plants are the grasses;[4] chief among these are grama grass, buffalo grass, wheat grass, and wire grass.

Plants of the composite family occupy second place. In the summer they are more conspicuous in many places than the grasses. Nearly a third of the common species belong to this family. The most noteworthy are:[5] blazing-star, golden-rod, cone-flower, golden aster, white aster, resin or gum-weed, nigger-head, worm-wood, sage, prairie-sage, sunflower, yarrow, prairie-pink, fleabane, and two with no common names, *Sideranthus*, *Actinella*.

The legume family ranks third. It includes some of the more abundant plants of these plains, notably[6] the prairie-clover, lead-plant, Dakota vetch, buffalo-bean, loco, lupine, and wild alfalfas (*Psoralea*) (Fig. 2).

Abundant monocotyledons, other than the grasses, are the wild onion and prairie lilies.[7] Dicotyledons other than the composites and legumes are numerous. There are several crucifers (mustard family), including[8] shepherd's purse, wall-flower, and *Lesquerella*, *Sophia*, *Arabis*. Several sorts of

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[2] The author is under obligations to the U. S. Biological Survey for determining the varieties of numerous mammals and a few birds; to P. A. Rydberg and Aven Nelson for naming plants; to Alexander Ruthven for determining reptiles and amphibians; and to L. P. Morse, W. M. Mann, and others for naming insects.

[3] The more important treatments of the plant ecology of the Northern Great Plains are R. Pound and F. E. Clements: The Phytogeography of Nebraska (Lincoln, 1900); H. L. Shantz: The Short Grass Formation of Colorado, *U. S. Dept. Agric. Bull. 201* (Washington, 1911); R. J. Pool: A Study of the Vegetation of the Sandhills of Nebraska, *Geol. and Nat. Hist. Surv. of Minnesota Botanical Studies*, Vol. 4, Part 3, pp. 189-312 (Minneapolis, 1914); and S. S. Visher: The Biology of South-Central South Dakota, *South Dakota Geol. and Biol. Surv. Bull. No. 5*, pp. 61-130 (Vermillion, 1912), and The Biology of Harding County, Northwestern South Dakota, *South Dakota Geol. Surv. Bull. No. 6*, pp. 11-103 (Vermillion, 1914).

[4] *Bouteloua oligostachya; Buchloe dactyloides; Agropyron tenerum, A. dasystachyum, A. Smithi; Sporobolus brevifolius.*

[5] *Liatris punctata; Solidago missouriensis, S. mollis, S. rigida, S. serotina; Ratibida columnaris; Chrysopsis mollis, C. hirsutissima; Aster hebecladus, A. oblongifolius; Grindelia squarrosa; Brauneria angustifolia; Ambrosia trifida; Artemisia frigida, A. aromatica; Helianthus Maximilianus; Achillea millefolium; Lycodesmia juncea; Erigeron asper, E. pumilus, E. ramosus; Sideranthus spinulosa; Actinella simplex.*

[6] *Petalostemon purpureus, P. oligophyllus; Amorpha canescens; Lotus americana; Astragalus caespitosus, A. succulentus, A. canadensis; Aragallus Lambertii; Lupinus argentus; Psoralea argophylla, P. cuspidata, P. digitata, P. tenuiflora.*

[7] *Allium recticulatum* and *A. rubrum; Leucocrinum montanum* and *Fritillaria atropurpurea.*

[8] *Capsella bursa-pastoris; Erysimum asperum, E. inconspicuum; Lesquerella lunellii, L. argentia; Sophia incisa, S. pinnata; Arabis hirsuta.*

evening primroses[9] are conspicuous because of showy flowers. Chenopods[10] are plentiful in the more clayey or more sandy areas. Three genera of scrophs or beard's tongues[11] help adorn the plains. The roses, wild flax, milkwort, false mallow, puccoon, plantain, *Oreocarya,* and *Cogswellia* also are represented abundantly.[12]

BIRDS[13]

Among birds the only permanent resident represented by many individuals is the desert horned lark.[14] Longspurs of some species are found in all seasons, the chestnut-collared and McCown's longspurs nesting here abundantly and the Lapland longspur wintering here. Two other members of the sparrow family, the lark bunting and the western vesper sparrow, are very numerous. The former is quite characteristic as is also the desert horned lark. Other prominent nesting birds are the Brewer's blackbird, burrowing owl, Sennett's nighthawk, upland plover, marsh and Swainson's hawks. Formerly the long-billed curlew and the prairie sharp-tailed grouse were common. Several birds nest in the groves or scattered trees along the streams (considered here as woodland), but often feed upon the steppe far from their nests. Examples are the ferruginous, rough-legged, and sparrow hawks. The cliff and barn swallows, nesting on cliffs or about buildings, also are seen often.

MAMMALS

No conspicuous species appears to be confined in its range to the steppe of the Northern Great Plains, though several varieties are. Of these the plains coyote, plains pocket-gopher, certain mice and voles may be mentioned.[15] Other mammals abundantly represented on the steppe are the[16]

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[9] *Anagra albicaulis, A. Nuttallii; Onagra striogosa; Gaura coccinea; Meridolix serraluta.*

[10] *Chenopodium album, C. Fremontii, C. uncanum, C. Watsonii, C. pratinocola, C. dacoticum; Atriplex argentea, A. canecensus, A. Nuttallii, A. Suchleyana; Suaeda erecta.*

[11] *Castelleja flava; Orthocarpus luteus; Pentstemon acuminatus, P. albidus, P. erianthera, P. grandiflorus.*

[12] *Rosa arkansana, R. Fendleri, R. Woodsi; Linum Lewisii, L. rigidum; Polygala alba; Malvastrum coccineum; Lithospermum angustifolium, L. linearifolium; Onosmodium occidentale; Plantago elongata, P. Purshii; Oreocarya glomerata, O. perenans; Cogswellia macrocarpa, C. montana.*

[13] For somewhat detailed discussions of the birds of the steppe of South Dakota, see the sections on birds in the reports by the writer mentioned in footnote 3, and articles by him in *The Auk* for 1909, 1911-13, and the *Wilson Bulletin* for 1912, 1913, 1915.

[14] In the interest of brevity and simplicity, technical names are used here only in case the common name does not indicate the plant or animal under discussion with a definiteness sufficient for the purpose of this article. Since the American Ornithologists' Union adopted distinctive names for the American birds at an early date and since these names are now familiar to all students of birds, the common names may be used here without misunderstanding. The scientific names of various widely distributed and well-known animals, such as the pronghorn antelope, bison, gray wolf, striped gopher, common toad, and rattlesnake are given only once or twice. As most common names of plants apply to more than one species, technical names usually are necessary for precision, and therefore are used more frequently. Reference to a plant by its incomplete name implies that the species is the one enumerated in the list of conspicuous species, where technical names will be found, or the one mentioned only a few lines above.

[15] *Canis latrans; Thomomys clusius; Geomys (bursarius) lutescens; Peromyscus maniculatus nebrascensis, P. leucopus aridulus; Perognatlius fasciatus.*

[16] *Cynomys ludovicianus; Taxidea t. taxus; Lepus c. campestris; L. californicus melantois; Mephitis (Chincha) hudsonica; Spilogale interrupta; Canis nubilus; Vulpes velox; Mustela longicauda; Citellus tridecemlineatus olivaceus, C. t. tridecemlineatus; Antilocapra americana; Bison bison.*

prairie-dog, badger, jackrabbit, large and small skunks, gray wolf, kit-fox or swift, long-tailed weasel, thirteen-striped spermophile, and formerly the antelope and bison (Fig. 4).

OTHER ANIMALS

The most common snake is the plains bull snake, with the plains blue racer next, and the western prairie rattlesnake third in most places and seasons. The horned lizard is numerous in many localities. The common toad is seen frequently. The Great Plains toad is characteristic but not abundant.[17]

Invertebrates, aside from the insects, are unimportant in this group of associations. It appears that only three of the numerous phyla are represented, the protozoa relatively sparsely, mollusca chiefly by but one species of land snail (*Succinea grosvenorii*), and the arthropoda by a few spiders[18] and centipeds, and by numerous insects of six of the eight orders: Orthoptera (grasshoppers and locusts), Diptera (gnats, mosquitoes, flies), Lepidoptera (butterflies and moths), Coleoptera (beetles) and Hymenoptera (bees, wasps, ants, and ichneumons), and Hemiptera (bugs). The locust and grasshoppers[19] are the most conspicuous insects and most injurious.

The Hymenoptera of several families (digger wasps, ants, woolly bees) are abundant. Blow flies, bot flies (*Gastrophilus equi*), and robber flies are plentiful. Lepidoptera are few upon the steppe.[20] The beetles are mostly ground beetles.[21] Bugs are very rare on the steppe.

"Adaptations" of the Life of the Steppe to Geographic Conditions

PLANTS

The plants display a variety of characteristics seemingly related to the environment, including:

The predominance of perennial grasses and herbs, the latter belonging chiefly to the higher orders. Although in favorable years annuals are conspicuous, herbaceous perennials are the characteristic vegetation. There are no large shrubs, and no trees. This characteristic is in contrast to woodland, desert, prairie, tundra, and most marshes.

The relatively firm turf which prevails in the more favorable portions of the steppe hinders the establishment of annuals, which are much more conspicuous therefore in the more arid and more sandy portions. Prairie fires occur frequently where there is a fairly close turf, for reasons already mentioned. Fires are powerful factors in preventing the spread of trees

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17 The technical names of these reptiles are: *Pityophis catenifer sayi; Bascanion constrictor flaviventris; Crotalus confluentus;* and *Phrynosoma douglassi hermandesi;* of the toads: *Bufo americanus* and *B. cognatus.*

18 Mostly of the jumping (*Phidippus*) and running types.

19 The genera more abundantly represented include *Melanophus* (*M. brivittatus* and others); *Sparogemon* (*S. aequale* and others); *Dactylotum* (*D. pictum*); *Phlibostoma; Hippiscus; Dissosteria* (*D. Carolina*); *Brachystola* (*B. magna*); *Nachyrhackis; Xiphidium; Opeia; Occanthus; Hadrotettiz* (*H. trifasciatus*).

20 Perhaps the following include the more abundantly represented genera: *Argynnis; Apatelia; Basilarchia; Chrysophanus; Coelnonympha; Colias; Lycaena; Thanaos.*

21 *Eleodes obsoleta, E. opaca, E. tricostata; Silpha ramosua; Harpalus eraticus* and others.

FIG. 2—A view on a cattle ranch near the southwestern corner of South Dakota. The coarse herb in the foreground is the "wild alfalfa," *Psoralea*.

FIG. 3—A general view of farming country in Gregory County, south-central South Dakota.

and shrubs. The larger shrubs are restricted chiefly to the more arid or more rugged portions where vegetation is discontinuous in its distribution and where combustible material is separated rather widely. During the six or eight months in which there is little vegetative activity because of the lack of sufficient heat or moisture, evaporation from all exposed living surfaces is continued by the drying winds which prevail on the steppe. Plants not presenting living surfaces from which extensive evaporation takes place when the water lost cannot soon be replaced, have an advantage over other species. If planted on the steppe, most of the shrubs and trees not especially resistant to loss of moisture through the bark, are killed during the months of inactivity rather than during the normal summer season.

Compactness of stalk or flowers, or both. Compactness of stalk is illustrated by almost all the plants. Few abundant upland species reach a height, in ordinary seasons, of much more than a foot, and exceedingly few reach three feet. The majority have most of their bulk within six inches of the soil (Figs. 2 and 4). The rose, sunflower, sage, and golden-rod, which have representatives in other ecological formations, are in most cases represented on the steppe by the dwarfed species of the genus. Two striking examples of small size are the plains rose, in many cases a simple bush less than five inches tall which bears but one flower, and the plains sunflower, which in most cases is less than seven inches high and in dry years, especially on clay, has many individuals which are less than four inches high. The conspicuous places held in the flora by the Compositae points to compactness of flowering parts. Even the grasses (grama, buffalo, wheat, and others) have the spikelets somewhat compactly arranged instead of loosely as in typically prairie and woodland species. Compactness of growth decreases exposure to the winds. In most ecological formations an insufficiency of sunlight results in a diffuse and extended growth. There is no such insufficiency during the growing season in the steppe.

Specialization of the root system. There are many plants which have developed a shallow, wide-spreading root-system. This appears to be a response to the many slight showers, the water of which does not soak in deeply. The buffalo and grama grasses have roots which penetrate a foot from the surface. In contrast to these there are such deep-rooted plants as *Psoralea,* a rather coarse herb, which has almost all of its finer roots at a depth greater than four feet, and in some cases penetrates hard subsoil more than six feet, and looser materials still farther. Certain genera, including the sages (*Artemisia*) and *Gutierrezia,* have both well-developed lateral roots and rather deep tap-roots. Most plants which are abundant on the more impervious soils have shallower root systems than those in the looser soils. Shrubs and coarse herbs have root systems which go down to greater depths than do those of lesser plants, probably because of their greater exposure to the winds. They need firmer anchorage and a more reliable water supply than is found near the surface. The plants showing storage

of water in enlargements of the roots are chiefly the blazing-star, the Indian-turnip (*Psoralea esculenta*), and the bush morning-glory (*Ipomoea leptophylla*). The cacti (*Opuntia, Mamillaria*) are the only plants which store considerable amounts of water above ground.

Prevalence of narrow or small leaves or thick cutin (epidermis). Most of the plants have either short or narrow leaves or both, and a few, like the prairie-pink, *Gutierrezia,* and the cacti, are almost leafless. Abundant species with resin include the cone-flower, gum-weed, and *Psoralea.*[22]

Many species have a thick epidermis, which in many cases is covered by numerous dry scales. The sages (*Artemisia, Eurotia lanata*), *Psoraleas,* and *Antennarias* have a grayish coloration due to such scales (Fig. 2).

These characteristics of leaves and cover clearly retard evaporation and thus appear to be responses to the moisture conditions of the steppe.

Pollination and seed dispersal accomplished, in a vast majority of the species, by the wind. The seeds of nearly 90 per cent of the abundant species on the steppe are distributed by the wind. The tumble-weed habit, in which the aërial part of the plant becomes detached from the root and is rolled across the plains by the wind, is developed almost solely by plants of the wind-swept plains. Several species with this habit, belonging to several families, are represented abundantly in the Northern Great Plains. The chenopod family is the chief one and is represented by the giant tumble-weed, the Russian thistle, and the bug-weed. Two legumes, the Indian-turnip and the wild alfalfa, two species of the *Amaranthaceae,* a composite, and two grasses also have this habit.[23]

Persistent surface winds, few places of lodgment such as (1) bodies of water, (2) very rugged areas, (3) thickets and other places unfavorable for steppe plants, and the scarcity of other agents of dispersal, all have contributed to the predominance of species dispersed by the wind.

Ability to mature quickly. The ability to mature quickly is possessed by most plants in this formation. The period between killing frosts in spring and fall is short, averaging about 120 days and having a minimum length of more than a month less. The growing season is shortened usually still further by dry weather in August and September. Few conspicuous plants require more than two months for the maturing of their seeds, and many need even less time. This is in contrast to the condition in most other formations.

Time of growth not closely confined as to season. The climate of the steppe is variable. In some years the vegetation is two weeks ahead of normal, and the next year it may be far behind. Delayed rains may cause a surprisingly late flowering. We have found the rose and even the pasque flower late in August, following July and August rains and a very dry spring and early summer.

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[22] Especially the case in *P. digitata, P. linearifolia* and *P. tenuifolia.*

[23] The chenopods are *Cyclonia artiplicifolium, Salsola pestifer,* and *Corispermum hyssopifolium;* the legumes, *Psoralea esculenta* and *P. floribunda;* the amaranths, *Amaranthus albus* and *A. graecisans;* the composite, *Townsendia sericea;* the grasses, *Panicum capillare* and *Schedonnardus paniculatus.*

FIG. 4.

FIG. 5.

FIG. 4—A view in the buffalo-grama grass association near Pierre, S. D. The velvet-like smoothness of the vegetation is suggested. The bison, a protected and much-prized herd, recall the enormous herds formerly found in this region.

FIG. 5—The prickly-pear is one of the most conspicuous plants of many areas in the Northern Great Plains. The grass in flower is the grama grass, far more useful and gentle than the cactus. The warping noticeable in several sections of the cactus indicates a depletion of their water content. Shortly after rains they often are distended.

Fig. 6.

Fig. 7.

Fig. 6—The spurge "snow-on-the-mountain" is perhaps the most conspicuous annual of the southern half of the area under consideration.

Fig. 7—A view in the bunch-grass association of south-central South Dakota. The trees, on a cliff, are Rocky Mountain yellow pine. The near clumps of vegetation are bunch grass and yucca (Spanish bayonet), the latter in fruit.

Destruction of exposed parts usually does not result in the death of the plant. The characteristic steppe plants have a wonderful resistance to prairie-fires and grazing, which may frequently destroy the aërial parts. Many typical plants, such as trees and shrubs, of other ecological associations are killed by the destruction of only a small part of the aërial growth. Certain steppe species are killed, however, by too frequent fires (oftener than once in three years, for example) or by close pasturing.

Ability to withstand inactivity, forced by drought, for even two or three years. After a series of wet years there are many new immigrants into the steppe. A dry year or two decimates or eliminates species which are only visitants to the steppe. The characteristic species seem to be almost uninjured by even prolonged drought. In the summer of 1911, for example, there were localities which for two years had been so dry that almost no grass had grown; yet when the unusual rains of August came, the ground was green within a few days.

Resistance to unseasonable warm spells and frost. The vegetation does not start quickly in the spring; but if, after it has started, a freeze comes, surprisingly few of the more characteristic plants are killed. The native steppe vegetation is seldom affected noticeably by early autumn frosts. In areas less likely to have unseasonable frosts, many species are severely injured when such frosts occur.

Marked seasonal succession depending on accumulated heat, water content of the soil, relative humidity, and precipitation. The succession of flowers, in an ordinary year, is striking. There are at least five well-marked periods, the prevernal, vernal, aestival, serotinal, and autumnal. During one period the plains are dominated by one group of flowers and during the succeeding periods by still others. The early bloomers of the steppe include *Cymopterus accaulis,* pasque flower, violet (*Viola Nuttallii*), and prairie lily. Among those blooming in June are the beard's tongue,[24] onions, camas (*Zygodenus intermedius*), loco, buffalo bean (*Astragalus*),[25] wild flax.[26] In July, niggerhead (*Braunia*), prairie-clover, wild alfalfa (*Psoralea*),[27] false mallow, stemless evening primrose (*Gaura*), and spurge are prominent. During August, the numerous species of asters,[28] golden-rod,[29] and the fleabane (*Senicio canus*) are in their glory. The sages[30] are in full bloom early in September.

Accompanying this progressive activity there occur transformations in the floristic complexion of the region. *Early in the season the plants are related mainly to eastern or mountain species, while, as the season advances,*

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[24] *Pentstemon acuminatus, P. albidus, P. erianthera, P. grandiflorus.*

[25] *Astragalus caryocarpus, A. flexuosus, A. lotiflorus, A. microlobus, A. Missouriensis,* and *A. triphyllus,* in addition to those given in footnote 6.

[26] *Linum Lewisii, L. rigidum.*

[27] Mentioned in footnote 6. The next three plants are *Malvastrum coccineum; Gaura coccinea; Euphorbia marginata, E. arkansana.*

[28] *Aster commutatus, A. hebecladus, A. multiflorus, A. oblongifolius.*

[29] *Solidago memorialis,* in addition to those mentioned in footnote 5.

[30] *Artemisia aromatica, A. cana, A. frigida, A. ludoviciana.*

conditions become more severe and the active or dominant species are successively related to plants of the prairies, drier plains, and finally the desert.

This succession corresponds with changes in the temperature of air and soil and in the moisture-content of soil and atmosphere.

Predominance of yellow flowers. Many of the more abundant species are yellow, although several conspicuous flowers are white, orange, or pale blue. There are few reds, deep blues, or violets. Very few are streaked or mottled. In the vast majority of cases the flowers are small in size as compared with those of other plant formations, and few are particularly fragrant. The color probably is related to the light conditions, and the fragrance to the windiness, which also affects the size of flower.

BIRDS

The birds of the steppe possess two or more of the following characteristics:

Nests are necessarily built on the ground.

Many kinds sing while on the wing. Examples are the lark bunting, longspur, Sprague's pipit, and frequently the western meadow-lark and horned lark.

The songs and calls are louder than those of birds of woodland or prairie. Because of the climatic conditions of the steppe, representatives of species in many cases are farther apart than in most other areas. Calls and songs fulfill their chief purpose only when they are heard by other individuals of the species, and therefore need to be relatively loud in the steppe.

Social flocking[31] *is less prominent than among the birds of the woods, water, or prairies,* where not only do various species migrate in large flocks, but troops wander socially about in other seasons, especially in winter, and several abundant species nest in colonies. The grackle, crow, swift, swallows, night-herons, blackbirds, marsh wrens, numerous water-birds, and the bobolink and dickcissel are examples. If the cliff swallow, which nests here and there in the badlands, be excepted, none of the abundant birds of the steppe nest in colonies. The scattered distribution of life on the steppe, noted in the preceding paragraph, is exemplified in the distribution of the nests of the steppe birds. The lark bunting and longspurs, and occasionally the Swainson's hawk, migrate in flocks which soon break up, however. Flocking in the winter is largely accidental. Birds gather where food is available, in areas swept by the wind or in patches of taller vegetation which are not snow-covered. Weedy fields, where seeds are abundant, are the favorite sites of such gatherings.

Many have the ability to withstand strong wind. For example, seedeaters feed during the winter in apparent comfort on wind-swept hills.

[31] Statements made by Wallace Craig in the paper referred to in footnote 1 have led to the erroneous generalization by a few animal ecologists unfamiliar with birds that gregariousness is a characteristic of steppe birds.

Females and nestlings are almost all protectively colored. This seems required by the exposure of the nesting sites.

Most species are highly migratory. Few individuals remain during winter, and these are of species different from those of summer, except in the case of the desert horned lark. Even this species migrates in a limited sense. The aridity and the inactivity of other life combine with the cold to encourage the desertion of the steppe during the winter season.

Most birds have the ability to withstand the intense heat of the sun. This is especially notable in the nestlings, which are often on dark ground.

The birds of the steppe of necessity must require but little drinking water. Heavy dews are rare.

The power of acute long-range vision appears to be possessed by a much larger number of the birds of the steppe than by those inhabiting woodlands. Clearness of atmosphere, moderate relief over large areas, and the widely scattered distribution of life all probably have encouraged the development of acute long-range vision.

MAMMALS

The mammals of the steppe have all acquired two or more of the following characteristics:

Ability to run swiftly. Examples are the antelope (32 miles an hour), jackrabbit (28 miles per hour), coyote (24 miles an hour), kit-fox, or swift (20 miles an hour), and gray wolf (20 miles an hour).[32]

It is possible to run more swiftly upon dry grassy plains than through woods or brush, in marshes or across rugged tracts. For this reason the inhabitants of such plains have come to be the fleetest of runners. Long-distance running was developed among some of the larger mammals, apparently because of the relative scarcity of places of retreat.

Ability to burrow. Examples are the pocket-gophers, striped gophers, badgers, prairie-dogs, mice voles. About 70 per cent of the species rear their young in burrows and nearly 50 per cent of the species spend much of their time underground. Burrows are retreats from heat, cold, wind, and some enemies, and for the prairie-dog, at least in some cases, furnish access to the underground water supply.

Many have acute long-range vision. The fleet runners all have. This appears to have been developed by the same factors mentioned in the discussion of the vision of birds.

A gray or tawny type of coloration which harmonizes well with dead leaves is possessed by nearly all. The skunk, an exception, is less in need of protective coloration than are the other mammals of the plains.

Ability to do without much drinking water. Water for physiological activity and for cooling by perspiration is secured mainly from the food

[32] Velocities are those attained by the normal, healthy adult when pursued by greyhounds, and are quoted from Ernest Thompson Seton: Life Histories of Northern Animals, 2 vols. (New York, 1909).

eaten. Footprints of most steppe mammals are seldom seen in mud about water holes. This is especially true in regard to the rodents, including the jackrabbit.

The daily period of activity is chiefly in the early morning, in the evening, and to a lesser degree at night. Voluntary activity of almost all abundant mammals of the steppe is very limited during the heat of the summer day, when as many as may are in the shade. Activity generates heat, which must be eliminated by perspiration, which in turn requires water, an article which is precious.

Ability to hibernate. The long-distance runners and the carnivores do not hibernate, but, with the exception of the rabbits, rodents, the most numerous mammals on the plains, do, and for longer periods than related species in other formations. Hibernation is a response to the unfavorable conditions which prevail during the winter months.

The larger herbivores, bison and antelope, migrated chiefly in response to irregularity in precipitation of rain and snow. Wolves, which preyed upon them, accompanied them in their wanderings.

A few of the mammals of the steppe are gregarious; the bison and antelope congregated probably for protection from wolves and bears and in response to the lack of numerous places of escape; but also in winter for the heat accumulated in a closely packed herd. Prairie-dogs are grouped into towns for protection against coyotes and certain hawks, and possibly by the somewhat restricted soil and ground-water conditions which they appear to require.

REPTILES

The reptiles, chief among which are the bull-snake, rattlesnake, and blue-racer, and the horned lizard, possess a surprisingly effective coloration; hibernate for nearly half the year, or even longer; can get along without drinking water; and are of small size as compared with related forms in more humid areas. Although the vast majority of reptiles lay eggs, two of the five abundant steppe reptiles (the rattler and horned lizard) bring forth their young alive. This may be in response to the ''hard'' climatic conditions which confront the young at birth.

INSECTS

Concerning the insects of the steppe, the following points may be made.

The diurnal period of greatest activity is in the forenoon from seven to eleven o'clock, after the chill of the early morning is gone, but before the heat becomes oppressive. Coitus is indulged in chiefly between eleven o'clock and one. During the rest of the twenty-four hours most of the insects are quiescent except when disturbed.

Seasonal activity is limited practically to the warmer and more moist three or four months of the year, chiefly June, July, and August. There is

almost complete inactivity during the colder and drier months of the year. Most species are dormant during ten or eleven months of the year, when many are represented chiefly by eggs.

Many forms burrow or occupy the burrows of mammals, in so doing having retreats from wind, heat, cold, and some enemies. Steppe species in many cases burrow to much greater depth than related species of other communities.

There is a predominance of hoppers or fast walkers. The development of hopping as a chief mode of progression is not so much discouraged on the steppe as in several other formations by frequent collisions with tall vegetation. The habit of running is favored by bare soil and is more marked among the insects of the drier than of the moister parts of the steppe, and still more among those of the desert.

Few species spend much time on the wing. The windiness of the steppe discourages extended flights. The occasional large flights of locusts form conspicuous exceptions to this rule.

Remarks Concerning the Several Associations Comprising the Steppe

THE BUFFALO-GRAMA GRASS, OR CLIMAX STEPPE, ASSOCIATION

This is the short-grass association par excellence and in many respects is the most characteristic steppe association (Fig. 4). In the central part of the steppe region it is found on a variety of medium soils, lighter clays, silts and loams, and is the dominant association over wide stretches. As the heavier and lighter soils are altered to loams by mixture and other processes, and as the drainage is perfected and ruggedness decreased, this association is extended at the expense of the other steppe associations.

To the east of the Great Plains province, the buffalo-grama grass association is represented on the high prairies on well-drained clay soil. In the more arid belt to the west it is found where the run-off is less rapid, as on the flattish tops of buttes and on terraces.

One of the two dominant grasses, the short, curly, buffalo grass is less tolerant of sand than is the taller grama grass, various species of which are of secondary importance in distinctly sandy areas.

The life of this association is more varied than that of other parts of the steppe. Many of the species mentioned as represented generally in the steppe are most abundant here, and in no other part of the steppe is found so large a number of species. In addition, the wire grass is abundant upon the more silty and loamy areas, and the needle grass (*Stipa*), and prairie June grass (*Koeloria cristata*) on the more sandy soil. The small milkweed (*Asclepias pumila*), the pincushion cactus (*Mamillaria vivipara*), and *Parosela aurea* are rather numerous.

Nearly all the birds of the steppe nest usually or occasionally in this association. Sprague's pipit is here characteristic. The bison and the prong-

horned antelope appear to have been at home here. The striped gopher is most abundant here, but reptiles and toads are less abundant.

THE NEEDLE GRASS, OR SANDY-LOAM STEPPE, ASSOCIATION

This association occupies uplands on sandy-loam soil and is characterized by the needle, devil's or spear grass, and June grass, just mentioned. In areas of rather uniform soil and topographic conditions these two grasses may dominate. In more sandy areas, coarse herbs of *Astragalus*,[33] lupines, and *Psoraleas* are very conspicuous and comparatively uniformly distributed, and sand grass occupies small areas, especially on slopes. In soils having a larger percentage of silt or clay, there are patches of buffalo and grama grass. The lead-plant is in evidence in areas of coarse sand or gravel mixed with finer materials. These herbs, and others that are represented less abundantly, have showy blue flowers. During the weeks preceding the shedding of the needles, this association is perhaps the most beautiful among all those of the steppe, because of the needles which glisten and wave in the breeze and the blue flowers then conspicuous. These are set off by the yellow and brownish flowers so widespread on the steppe. When the needles are ripe they become readily attached to clothing, long hair or wool, and by the help of several twists which develop as the needles dry, readily work inward and often cause pain. For obvious reasons, hay containing many needles is much less desirable than common prairie hay. The mowing and grazing, especially by sheep, of areas infested with needle grass is confined preferably to the season before the seeds begin to ripen early in July.

THE WHEAT GRASS, OR CLAY STEPPE, ASSOCIATION

The dominant grass on clay is the western wheat grass, sometimes popularly known as salt grass. It is widespread in areas where shales outcrop and along flood-plains. This grass has a very much larger percentage of its growth more than two inches from the soil than do the other widespread steppe grasses of fairly level areas. It also responds to an increased supply of water in a more satisfactory manner than the other abundant steppe grasses; in fact in some places and in some seasons, it attains a height of two feet. It therefore is a valuable hay crop along the flood-plains and on other areas which are flooded frequently, but upon which the water does not stand long. Because clay is relatively impervious, the percentage of absorption is slight except where the water stands for a time. In response to these geographic factors, enterprising farmers and stockmen erect wing dams and dig contour ditches in favorable places, and use flood waters to produce excellent meadows.

Although wheat grass is present in a rather pure stand in areas which are flooded frequently, in many places various other species are conspicuous.

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[33] *Astragalus mollissimus, A. adsurgens, A. canadensis; Lupinus pusillus.*

The variety of abundant plant and animal life is normally less in this than in other parts of the steppe, however.

On well-drained slopes on the "gumbo," the vegetation is scanty except in wet seasons, and the soil is little concealed. Among the scattered growth of grass, various chenopods[34] and the crucifer pepper-grass (*Lepidium*) and prickly-pear cactus and the dock (*Rumex venosus*) are conspicuous in many places, as are also the Dakota vetch and the gumweed.

On the somewhat alkaline soil of many "blow-outs" and other undrained depressions, alkali grass replaces wheat grass, while the smaller prickly-pear (Fig. 5) is in many places exceedingly abundant. Two or three kinds of chenopods are often conspicuous.[35]

On valley flats the spurge, "snow-on-the-mountain" (*Euphorbia marginata, E. Arkansana*), is dominant in some seasons in many places, especially near the bluffs and in prairie-dog towns. It is perhaps the most conspicuous annual growing on the steppe (Fig. 6). The bur-tomato (*Solanum rostratum*) is another annual which is sometimes conspicuous in similar situations and also in deserted fields. Since valley flats receive the run-off from an extensive area, there is a sporadic occurrence of numerous species belonging to other associations, many of which, however, do not mature their seeds.

The wheat-grass association is at many points contiguous to groves along the streams and to shrubby associations, especially the buck bush and sage, and upon the areas of alluvium, with buffalo-grama or meadow-grass associations.

Few birds nest in the wheat-grass association. The relative barrenness of the upland areas and the frequency of flooding of the other portions are doubtless major deterrent influences. The sharp-tailed grouse, however, is more numerous in the flood-plain phase of this association than elsewhere, possibly because the taller vegetation affords more protection than the upland associations. Each prairie-dog town has one or more broods of burrowing owls.

The prairie-dog is the most conspicuous mammal. In parts of this association, notably in southwestern South Dakota, nearly every low terrace along the valleys is occupied along much of its extent by prairie-dog towns. The danger of being drowned out by the flood water is greatly decreased by piling up around each hole much of the dirt brought up from below. Many entrances are as much as 12 or 15 inches above the general level of the "flat." This piling up is not accidental, as is shown by the repeated repairing by scraping dirt in from the periphery of the mound, and by the fact that in areas not subject to frequent flooding the detritus brought up from

[34] *Atriplex canescens, A. hastata, A. Nuttallii, A. philonitra; Chenopodium album, C. Fremontii, C. glaucum, C. dacoticum, C. subglabrum, C. pratinicola, C. Watsonii; Corispermum nitidum; Monolepsis nuttalliana; Suaeda erecta, S. depressa.*

[35] This grass is *Distichlis spicata;* the cactus *Opuntia fragilis;* the most numerous chenopods, *Atriplex canescens* and *Monolepsis nuttalliana.* The purslane *Talinum parviflorum* sometimes is conspicuous and nearly always is characteristic of blow-outs.

below is scattered widely. The long-tailed weasel and the black-footed ferret, which prey upon the prairie-dog, are numerous, though not often seen. Gophers and other burrowing mammals are lacking in most of the flood-plain areas in the gumbo region, probably because of the floods.

THE BUNCH-GRASS, OR DRY-SOIL STEPPE, ASSOCIATION

The dominant feature of this association is the bunch grass, which attains a rather uniform height of about 15 inches. The clumps are stiff, sparingly eaten, and conspicuous throughout the year since they are seldom covered by snow for more than a short time.

This association has two distinct phases, (1) on slopes in rugged areas, bluffs along streams and in moraines, where the soil is not clay or sand; (2) on relatively pure sand. The latter may be subdivided into (a) the more nearly level stretches and (b) the sandhills. The first phase (Fig. 7) occupies but a small total area, but is widespread, being present in each of the districts and in most of the sub-districts of the Northern Great Plains. The second phase is best developed in middle and western Nebraska, where sand, commonly heaped into dunes, is dominant. The area of dunes reaches a very short distance into south-central South Dakota. This association also is present in some places along valleys where the alluvium is very sandy.

The determining geographic factors in this association appear to be a scarcity of moisture in the surface layers of the soil, and a soil which is readily penetrated by roots. In areas of sand, although the run-off is slight, there is normally but little moisture in the upper six inches or more. This is the result of the active evaporation which persists until the capillary tubes are broken. Consequently vegetation possessing only shallow root systems, as does much of that of the buffalo-grama and wheat-grass associations, is barred. The vegetation of this association is characterized by deeply penetrating root systems, in many cases with prominent "tap-roots."

The Spanish bayonet, or soap-weed (Fig. 7), is conspicuous, while *Mentzelia* and the pasque flower are numerous on the steeper slopes outside the sandhills.[36]

The bird most generally nesting in this association is the western vesper sparrow. The western field sparrow is locally numerous. Several mammals, notably the jackrabbit, coyote, and badger, often rear their young in the rugged areas dominated by bunch-grass. Such areas afford partial protection by their tall vegetation as well as by their relief. The rapid run-off is an additional factor in their desirability as bird resorts.

The sandhills[37] as seen from a distance are not inviting; they appear as a low line of monotonous yellowish hills, or, if one look down from a divide, a complex of irregularly arranged dunes with here and there the glimmer

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36 *Yucca glauca; Mentzelia nuda* and *M. decapetala; Pulsatilla hirsutissima.*

37 R. J. Pool's study of the vegetation of the Nebraska sandhills (see footnote 3) is a voluminous report. For a brief earlier account, see S. S. Visher: The Plants of the South Dakota Sandhills, *American Botanist*, 1914.

of a pond. Only the bright yellow of a patch of freshly exposed sand, or the dark green of a marsh filled with vegetation, break the monotony.

It is only when one is within the dune district and sees the variety of vegetation that the reason for the reputation which sandhill districts have among botanists and picnickers becomes evident. There is a striking contrast between the more level, dry clay plains covered with a carpet of short "buffalo" grass and the rough sandhills, with their tall clumps of bunch grass, many fruiting shrubs, and narrow valleys filled with dense thickets through which ripple clear, cold brooks. Though the sand is fairly fertile, it is likely to drift badly when cultivated. Pastures here are in ill repute, because of the tendency of their soil to blow; and although there are small meadows, the roads are so heavy that it does not pay to haul hay far. Perhaps it is the impression of irredeemable wildness that gives the sandhills part of their attractiveness.

The many differences between the adjacent grassy plains and the sandhills seem to be due almost entirely to the sand. In elevation there is no notable difference; it is not likely that there is more precipitation; it is readily apparent that the sandhills in general are no cooler.

The sand, being loose and porous, absorbs at once all rainfall, even during a heavy shower. The result is that before any considerable percentage of a given rainfall has disappeared by evaporation it is beyond reach of the chief agents of evaporation. The balance escapes slowly from the many voluminous springs which supply the brooks and from the leaves of the vegetation.

As might be expected, the air temperatures become very high during sunny days, especially in the depressions. The vegetation must either be able to endure rapid evaporation or it must be able to resist drying by possessing restrictions against evaporation. Both responses are found. The bunch grass (*Andropogon*), roses, bush morning-glory, sunflower, and sand thistle are examples of the former; the cacti, sand cherry, yucca, and prairie-pink are conspicuous examples of the latter. A number of the characteristic plants have much longer tap roots than even closely related species of the areas of harder subsoil; a few, including the cacti, bush morning-glory, and *Psoralea lanceolata* have organs for storage of water.

The prominent plants are perhaps the following.[38] The bunch grass is dominant; sand grass, and spear or needle grass are common, both growing here in small clumps. Grasses growing between the bunch-grasses are hair grass, grama grass, and the sand-bur. The shrubs of the sandhills are sand-cherry, choke-cherry, plum, dogwood, prairie willow, lead plant, buffalo-berry, and the wild rose. Spanish bayonet is abundant.

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[38] The technical names of these prominent plants are: *Andropogon scoparius, Calomovilfa longifolia, Stipa comata, Eragrostis trichoides, Bouteloua hirsuta, Cenchrus tribuloides; Prunus Besseyi, P. melancarpa, P. americana; Cornus stolonifera, Salix humilus, Amorpha canescens, Lepargyraea argentea; Rosa woodsi, R. arkansana, R. suffulta; Yucca glauca.*

FIG. 8.

FIG. 9.

FIG. 8—Looking southeastward from Sheep Mountain, S. D.: one of many splendid views in the White River badlands. The steep slopes are nearly bare. At the right a gnarled cedar and some greasewood plants may be seen.

FIG. 9—This view shows a remnant of a former terrace now dissected into superb badlands and largely barren; also a low terrace covered mostly by wheat grass tall enough to mow. In the most thoroughly drained parts of the "flat," the short-grass association is replacing that of wheat grass.

The more conspicuous herbs other than grasses are perhaps[39] the annual *Eriogonum,* spiderwort, brome rape, *Allonia, Abronia,* the spurges, the showy *Gilia,* green milkweed, and three members of the *Caper* family. Legumes are numerous, lupine, prairie clovers, and the narrow-leaved *Psoraleas* being most numerous. The more common composites are the wormwood, the viscid aster, and *Franseria acanthicarpa.* The borders of the brooks, often quite gay with flowers, are not truly a part of the steppe.

Most of the animal life of sandy regions is associated with the springs and streams. The areas occupied by the typical sandhill vegetation have a sparse and not distinctive fauna so far as the larger animals are concerned. Of such typical portions the birds most abundant are the western vesper sparrow, lark bunting, and the western meadowlark. Sandy areas within the prairie region of Sanborn County, eastern South Dakota, form eastern outliers of the breeding range of the prairie sharp-tailed grouse. The mammals most frequently seen are the jackrabbit, the cottontail,[40] and the plains chipmunk. Because of the relative wildness of rough, sandy areas, they form retreats for wide-ranging mammals such as wolves and coyotes. Of the reptiles, the most abundant snake is the hog-nosed adder. The yellow-striped swift is plentiful in the more southern sandhills, and another lizard occurs, as does a land turtle. Several insects are abundant in sandy areas, including certain tiger beetles and the ant lion.

The sandhill areas of Nebraska and along the southern margin of South Dakota have an exceptionally varied flora and fauna. In addition to species of more general distribution, mentioned above, the following are abundant there:[41] Hall's bunch grass, on the ridges; the southern sand-bur, the bush morning-glory, poison ivy, and dogwood. There are a few trees, especially the hackberry, cottonwood, and elm in depressions, or on the more stationary north-facing slopes. Among the herbs, the prickly poppy, sand thistle, *Froelichia campestris,* and a fourth representative of the Caper family are very conspicuous in season.

THE LOW SHRUB GROUP OF ASSOCIATIONS

This group of associations is represented in small areas, mostly by narrow bands, in the steppe formation. The buck-bush is a transition stage between grassland and woodland, and the sage brush between grassland and desert. Most of the area ordinarily classed as badlands belongs to the buffalo-grama

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[39] The herbs referred to are: *Eriogonum annuum; Tradescantia occidentalis; Orobanche ludoviciana; Allonia linearis, A. nyctaginia; Abronia micrantha; Euphorbia hexagonum, E. Geyeri; Croton texensis; Gilia cephaloidea; Acerates viviflora linearis; Cleome lutea, C. serrulata; Polanisia trachysperma; Lupinus pusillus; Kuhnistera purpurea, K. villosa, K. alba; Psoralea lanceolata, P. tenuifolia; Ambrosia media, A. psilostachys; Machaeranthera sessiliflora.*

[40] The technical names of other animals mentioned in this paragraph are: *Sylvilagus nuttallii grangeri; Eutamias pallidus; Canus nubilus, C. latrans, C. n. nebrascensis; Heterodon nasicus; Sceloporus undulatus consobrinus; Cnemidophorus gularis; Terrepene ornata; Cincendela scutelaria, C. envibata, C. vermista.*

[41] *Andropogon Hallii, Cenchrus carolinianus, Ipomoea leptophylla, Rhus Rydbergi, Cornus stolonifera riparia, Celtis occidentalis, Populus Sargentii, Ulmus americana, Argemone intermedia, Carduus plattensis, Cristatella Jamesii.*

FIG. 10.

FIG. 11.

FIG. 10—A butte whose top is sand. The dense vegetation on the sand is in striking contrast with the nearly barren clay slope below.

FIG. 11—The "gumbo-lily," a stemless evening primrose, is one of the few herbs that grow upon the almost barren badland areas.

and the wheat-grass associations. However, on the steeper slopes, the portion most distinctly "badland," almost the only vegetation consists of various shrubs (Fig. 8).

Buck-bush. The buck-bush, or wolfberry (*Symphoricarpus occidentalis*), a shrub which as a rule is about 16 inches tall, forms patches in and adjacent to groves along valleys throughout the Northern Great Plains. It is also found here and there on slopes, especially where soil moisture is plentiful, which more often is the case on north-facing than on other slopes. Even far from woodland, there are patches along flood-plains where the ground water is within reach. The buck-bush patches, many of which have a diameter of several rods, have, where dense, little value for pasturage and almost none for fodder. They are cut by the mower with difficulty, nor are they killed readily by plow or fire. Wild roses are common secondary species in these patches. The chief grasses, in most places very subordinate in importance, are blue-joint (*Andropogon furcatus*) and wild rye (*Elymus canadensis*).

There are no large animals restricted to these patches, though there are many nests of birds. In the steppe region, the prairie sharp-tailed grouse, long-billed curlew, upland plover, marsh and Swainson hawks, and other large birds, as well as western meadowlarks and Brewer's blackbirds often nest here. Cottontail rabbits and gophers (*Citellus tridecemlineatus, C. Franklini*) are at home here. Spiders are especially abundant.

Sage-brush. The true sage-brush (*Artemisia tridentata*) is represented very locally in South Dakota or North Dakota on silt along the lower terraces of some of the streams of the western part of these states, notably along the Little Missouri River, Sage Creek in Pennington County, and Indian Creek in Fall River County, the two last in southwestern South Dakota. It is somewhat more widespread in northwestern Nebraska. In these states it is a low shrub attaining less than half the height prevalent in more arid regions to the west. However, the number of individuals per square rod in many places is greater than farther west.

The lance-leaved sage (*Artemisia longifolia, A. filifolia*) is more widespread and is here a taller shrub, reaching a height of two or even two and a half feet. In the western third of South Dakota it occupies silty soil chiefly on terraces.

The vegetation between the clumps of sage in many places is dominated by patches of buffalo grass. Upon soil which is almost bare, the curious foliatious lichen *Parmelia mollinscula* is abundant in many places. Clumps of prickly-pear cactus are conspicuous.

The most conspicuous bird characteristic of the sage-brush is the sage-hen, which was numerous here until a few years ago. It is being exterminated rapidly.

The most notable insect is the large black-and-white sage-moth, which is

FIG. 12.

FIG. 13.

FIG. 12—A view across the valley of the Teton, or Bad, River, showing part of Philip, S. D. Note the fine "bench," or "flat," just beyond the town.

FIG. 13—A "claim shanty" constructed chiefly of prairie sod.

very conspicuous for a few days in July and August. The larvae feed upon sage leaves.

Badlands. Badlands are developed in many places on clay in the Northern Great Plains; those in south-central South Dakota and in the Little Missouri Valley in North Dakota are especially extensive. Large sections of these badland areas are comparatively barren. Still larger portions are nearly level and grass covered (Fig. 9). The latter are discussed under the wheat-grass and buffalo-grama grass associations.

(*a*) *Conditions.* In regard to precipitation, these areas fare about the same as does the rest of the steppe. Their average temperature is probably greater because of the high percentage of slopes and partial protection from the wind. The whitish clay reflects the sunlight, resulting in a great intensity of light at times. During other hours of the day, a given spot may be in the shade. Shade can always be found along arroyos and behind steep-sided buttes. The rapidity of erosion in badlands, and the tendency of the clay to crumble and crack (Fig. 11), are two factors apparently very important in controlling vegetation. Another perhaps even more important factor is the inability of the materials to absorb or hold water. In the White River badlands there are some sandhills, and some of the badland buttes nearby are capped with sand. Erosion is evidently as rapid on such buttes as elsewhere, but a rank vegetation flourishes, apparently because of the water absorbed in the sand (Fig. 10).

(*b*) *Characteristic plants and animals.* In the more rugged badland areas, vegetation is scanty. Such as there is, is mainly shrubby and possesses long tap-roots. Various shrubby composites are especially conspicuous, especially the rabbit bush, *Gutierrezia Sarothrae, G. divaricata,* blue-aster, golden-aster, false bone-set, and several species of sage. Other plants are the gumbo-lily (Fig. 11), *Mentzelia,* salt bush, prickly pear, grease weed, and, locally, *Chenopodium Watsonii.* At the foot of the buttes, two annuals, the showy spurge, and thistle-tomato, frequently are found. Along the channels, the buffalo-berry forms many large thickets, and on the more shaded side of many buttes are clumps of western red cedar from which may be made good fence posts.[42]

The badlands, because of their relative inaccessibility, are the home of several carnivores. Gray wolves and coyotes are more frequently met here than in the plains roundabout. Bobcats[43] are plentiful. The puma, or mountain lion, was formerly not rare. A few antelope still feed on some of

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[42] The scientific names of the above badland plants are: *Chrysothannus gravolens; Senicio canus; Townsendia grandifolium; Chrysopsis hirsutissima; Khunia glutinosa; Artemisia filifolia, A. longifolia, A. frigida; Pachylophus caespitosa, P. macroglottis, P. montanus; Mentzelia decapetala, M. nuda, M. stricta: Atriplex Nuttallii, A. Suchleyana, A. argentea; Opuntia fragilis; Sacracobatus vermiculatus; Euphorbia marginata; Solanum rostratum; Lepargraea (Shepherdia) argentea; Juniperus scopulorum, J. sabina.*

[43] The following are the technical names of the remaining mammals and reptiles mentioned: *Lynx rufus; Felis concolor; Antelocapra americana; Ovis canadensis auduboni; Odocoileus h. hemionus; Eutamias pallidus; Crotalus confluentus; Phrynosoma douglassii hermandesi.* A common bat is *Myotis californicus ciliobrum.*

the "flats." Bighorn sheep and mule deer formerly were common, and the bighorn may not yet be extinct in the White River badlands. The mammal now most frequently seen in badlands is the striped chipmunk. The chief birds are the rock wren, Say's phoebe, cliff swallow, violet green swallow, western lark sparrow, turkey buzzard, and prairie falcon. Rattlesnakes are not lacking, though far from common. The horned lizards ("toads") are seen occasionally.

(*c*) *The badland life* displays several peculiarities. The plants are mainly long-lived perennials, chiefly shrubby composites, and possess powerful tap and anchor roots and narrow and pubescent leaves. Such shrubs offer great resistance to erosion, undercutting, and slumping. They also are conservative, late-flowering, and present to cattle very little edible material. Nearly every species has yellow flowers. In addition to these perennials, there are various annuals which thrive during wet years on the moister alluvial flats.

The animals are grayish in color with the exception of the bats, swallows, and swifts. The crevices and cavelets furnish homes for the chipmunk, bat, bobcat, Say's phoebe, prairie falcon, and rock wren. The cliff swallow and white-throated swift find cliffs suitable for nesting sites. Several of the larger mammals, notably the bighorn sheep and mule or black-tailed deer, are powerful jumpers.

SALTA, AN EARLY COMMERCIAL CENTER OF ARGENTINA

By G. M. WRIGLEY

The Beginnings of Salta

Lima to Buenos Aires—a long road and weary for man and beast; an old road and romantic, worn by centuries of travel. Southward perhaps as far as Tucumán the road was an Inca institution. Garcilaso de la Vega says[1] Tucumán was subject to the Inca Vira-cocha and sent him tribute of cotton cloth, honey, maize, and other products of the country. But the old road is essentially Spanish, a tribute to the undaunted Spanish spirit that stayed not for physical barriers, and a monument of the restrictive colonial policy of Spain. The road runs from Atlantic to Pacific, not far short of 3,000 miles, and for half its length maintains an altitude above 12,000 feet. Along it, during the normal state of affairs, was carried all the colonial trade of the La Plata Provinces, going via Lima to Porto Bello on the isthmus of Panama, where the great annual fair focused the trade of an entire continent. The predominant feature of the commerce was the immense exportation of silver, practically the exclusive export of Peru. The demand for the precious metal was intense, and moreover it was a product whose nature and intrinsic value enabled it to stand the costs and difficulties of transportation. Equally it constituted a cargo whose transmission across the high seas was fraught with peril, whence was due, in no small measure, the adoption of the fleet and fair system, a method of trading antiquated in Europe.

The Lima-Buenos Aires road (Fig. 1) naturally called for the erection of settlements at strategic sites. On the Bolivian plateau it accounts for the early foundation of La Paz (1549), in the section between Potosí and Cuzco. In the Argentine section Salta is the most notable town owing its existence to the road. It lies roughly midway between the terminal points and thus in the early days was most remote from their respective authorities. Velasco, describing[2] the southern portion of the Viceroyalty of Peru in the second half of the sixteenth century, states that lack of communications prevented him from obtaining any knowledge of Tucumán and the territory under its jurisdiction (including Salta). Light is thrown on the frontier situation by the strenuous opposition[3] on the part of an early governor of Tucumán to the foundation of a town in Salta or Jujuy, lest improved communication

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[1] Garcilaso de la Vega: Royal Commentaries of the Yncas, Book 5, Chapter 25, *Hakluyt Soc. Publs.*, 1st Ser., No. 45, London, 1871.

[2] (Juan) López de Velasco: Geografía y descripción universal de las Indias (written 1571-74), Madrid, 1894, p. 510.

[3] Pedro Lozano: Historia de la Conquista del Paraguay, Rio Plata y Tucumán (written 1745), Buenos Aires, 1873-74, Vol. 4, p. 321.

should facilitate the conveyance to headquarters of information on his bad government!

The Bolivian plateau, as all parts of the realm where Inca rule had been firmly established, was remarkably safe for travel. The pampas, too, offered little trouble during the greater part of colonial times, but in the intermediate or transition section serious opposition was encountered from the natives. To the southeast of the Bolivian Andes, in the foothills, dwelt the Chiriguanas and on the Gran Chaco plains the Tobas and Matacos, savage and much-feared tribes. Even at the present day the Tobas have been but lightly touched by civilization. Immediately south, the Andean valleys, peopled by tribes more civilized but no less warlike, afforded the only practicable routes between plateau and plains—the *quebradas* of Humahuaca, del Toro, and Calchaquí. The Calchaquí were particularly troublesome. They were indeed only subdued by a rigorous campaign carried out in the middle of the seventeenth century. For ages inter-*quebradal* commerce had been carried on with the Valley of Lerma as center.[4] It was the meeting place for the *quebrada* routes and for those of the Chaco and Pampas. As a strategic location it was unrivaled.

Fig. 1—General location map showing the old mule trail from Buenos Aires to Lima (represented by the dotted line). Scale, 1:40,000,000.

In detail, the site of Salta offered exceptional advantages for defense. It lay between two rivers and in the midst of marshes and swamps, *tagaretes*, impenetrable save by a few easily guarded causeways. In 1582 Hernando de Lerma here founded the town to which he gave the name, subsequently changed to Salta, of San Felipe de Lerma. At various times efforts were made to change the site of the town, but the hygienic argument never proved strong enough, and Salta has maintained its old position and likewise its reputation for paludinal fever.[5] In the Archives of the

[4] Éric Boman: . . . Antiquités de la région andine, 4 vols., Paris, 1908; ref. in Vol. 1, p. 253.

[5] Paludism is still a serious problem in the provinces of Salta, Jujuy, and Catamarca. In Salta province the mortality from this disease is 143.3 per 1,000. During the last quarter of 1912 the hygienic commission waging a campaign against paludism treated 6,361 cases out of a total population of 138,043 (*Memoria del Ministerio del Interior, 1912-1913*, Buenos Aires, 1913, pp. 343-373).

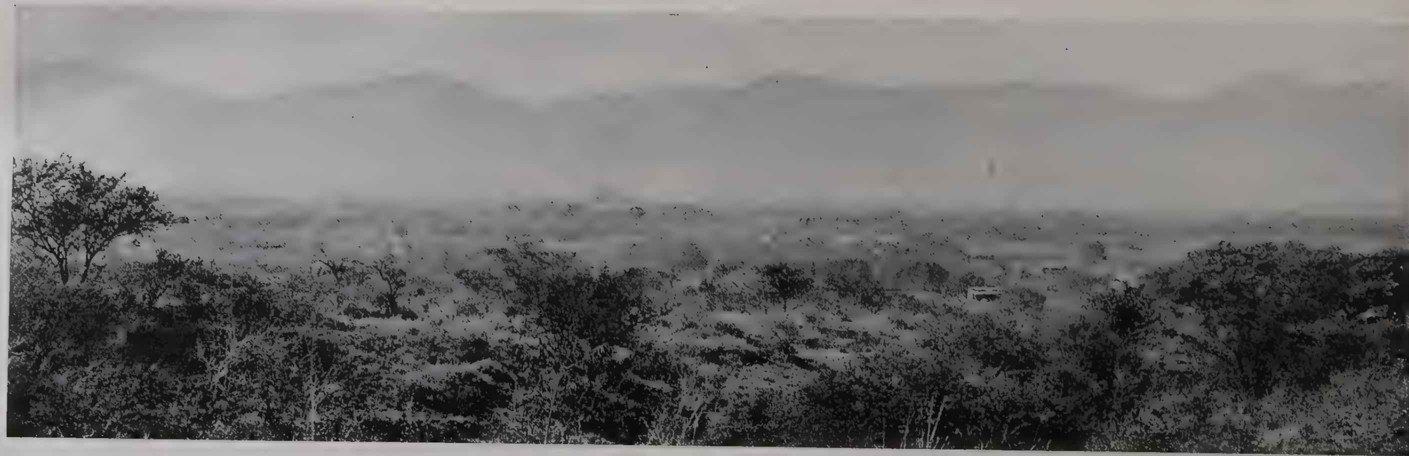

FIG. 2.

FIG. 3.

FIG. 2—The Lerma Valley with the town of Salta in the middle distance, looking west.
FIG. 3—The agricultural lands of the Salta basin; looking east at a point near that from which Figure 2 was taken.

Indies[6] is preserved a document describing Salta eight months after its foundation: "It will be of importance in the event of war in the territory as in the valleys of Calchaquí, Omaguaca and Xuxui, lands very rich in gold and silver. This valley of Salta is very good and fertile, . . . highly suitable for raising cattle and foodstuffs in great variety; . . . . it should produce the vine in abundance . . . . It also borders on the Tobas, a bellicose people whose plundering habits grow worse day by day" (Figs. 2 and 3).

Colonial Salta and the Mule Trade

A point of mere strategic interest in 1582, Salta rapidly acquired fame as the center of a highly important phase of colonial internal trade.

The pampas of Buenos Aires bred stock in vast numbers: cattle, valued chiefly for their hides, horses, asses, and mules. The last-named beast of burden was destined in particular for service in Peru. The journey to this distant market was accomplished in three stages. The first, from the native pastures to Córdoba, was sufficiently arduous.[7] The treeless, stoneless pampas, with limited water supply, restricted the size of the troop to six or seven hundred head. Until the *monte,* or thornbush, region was entered near Córdoba, corrals had to be constructed of stakes bound by hide thongs, and incessant watchfulness was entailed on the part of the twelve muleteers, who with forty horses were attached to the average troop. Arrived at the objective the troop was pastured for some months. For such a purpose Córdoba was admirably adapted.[8] Situated in the basin of the Rio Primero, at the foot of the Cordovese Hills, it offered in the rainy season water and pasture in abundance.

Towards the end of April, the mules were newly formed into troops for the second stage. With the exception of the *travesia,*[9] a dry sandy zone

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6 Relación de las Provincias de Tucumán que dió Pedro Sotelo Narvaez, vecino de aquellas provincias, al muy ilustre Señor Licenciado Cepeda, Presidente deste Real Audiencia de La Plata. Relaciones Geográficas de Indias, Vol. 2, p. 150 (La Ciudad de Lerma), Madrid, 1885.

7 The above description is largely based on material contained in the eighteenth century guide-book "El Lazarillo de Ciegos Caminantes desde Buenos-Ayres hasta Lima con sus Itinerarios segun la mas punctual observacion, con algunas noticias utiles á los Nuevos Comerciantes que tratan en Mulas; y otros Historicas. Sacado de las Memorias que hizo Don Alonso Carriò de la Vandera en este dilatado Viage, y Comision que tubo por la Corte para el arreglo de Correos, y Estafetas, Situacion, y ajusto de Postas, desde Montevideo. Por Don Calixto Bustamante Carlos Inca, alias Concolorcorvo Natural del Cuzco, que accompañò al referido Comisionado en dicho Viage, y escribiò sus Extractos." En Gijon, en la Imprenta de la Rovada, Año de 1773. The book is rare, and the exceptionally interesting nature of its contents is heightened by the mystery of its authorship and its publication. Though the place of publication is given as Gijon, authorities are generally agreed that the imprint was clandestinely executed in Lima. A limited edition with biographical notes and comments was published in Buenos Aires, 1908, by the Biblioteca de la Junta de Historia y Numismática Americana.

Brief notices on the Salta mule trade of colonial times may be found in contemporary works: Acarete du Biscay: An Account of a Voyage up the River de la Plata, London, 1698; Rolt: A New and Accurate History of South America, London, 1756; Antonio de Ulloa: Noticias Americanas, Madrid, 1792; and Antonio de Ulloa and Jorge Juan: Relacion Historica del Viaje a la America Meridional, Madrid, 1748.

8 Córdoba has always been an important station on the road. Between the years 1602 and 1665 it was the seat of a custom house erected for the purpose of levying a 50 per cent impost on all commodities passing between Peru and the River Plate Provinces. C. E. Akers: A History of South America, London, 1904, p. 11.

9 Woodbine Parish: Buenos Aires and the Provinces of the Rio de la Plata, London, 1838, p. 252.

on the farther side of Santiago del Estero, the route was, at this season of the year, less difficult of accomplishment, and the troops could be augmented to thirteen or fourteen hundred head in charge of twenty men and seventy horses. The cavalcades aimed at reaching Salta not later than the end of June, i. e. at making the journey after the subsidence of the summer floods and before the period of maximum drought.[10] At Salta the mules remained in pasture until the fair, which began early in February and lasted throughout March. This was Salta's period of activity, though hardly, as Bustamante says, of pleasure. Damp meadows, well-nigh impassable roads[10] and the confinement of such numbers of beasts in a necessarily contracted space caused a discomfort not difficult to understand. At the fair were gathered men from the farthest parts of the Viceroyalty for the exchange of some 60,000 beasts, i. e. mules alone, without including the minor transactions in horses and cattle. Here, too, dealers from the pampas made the necessary arrangements for the return journey and Peruvian buyers for the transmission of their troops to the plateau. Salta merchants made no little profit out of the last item, for the muleteers engaged for the journey commonly took or were required to take a part of their wages in goods. The fair concluded towards the end of the rainy season when subsidence of the swollen mountain torrents permitted a safer continuation of the journey.

The troops, increased to seventeen or eighteen hundred head, set out from Salta under the care of two bands of horsemen.[11] The second band, required to check straying—facilitated alike by the topography and the freshness of the beasts—accompanied the cavalcade as far as the *quebrada* of Queta, 60 leagues beyond Salta. Beyond this point taming of the now chastened beasts was begun, and henceforth they could be turned loose to graze on the pastures of the mountain slopes, for pasture along the road was limited.

Thus by slow stages they reached the markets and distributing centers of the plateau. The chief of these were Oruro, Corporaca, and Jauja. Oruro was then as now a center for the mining districts of Bolivia (Upper Peru). Corporaca, a little south of Cuzco, served the central zone, and Jauja, within easy reach of the silver of Cerro de Pasco and the quicksilver of Huancavelica, was also on the royal road to Lima and the coast valleys.

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10 The mean annual rainfall of Salta, for the period 1873 to 1907, is 571 mm. Of this amount only 16 mm. falls in the dry season, May to September (Walter G. Davis: Climate of the Argentine Republic, Argentine Meteorol. Office, Buenos Aires, 1910).

11 Bustamante (*op. cit.* under 7) gives some interesting, but unfortunately incomplete, financial details. Young mules of the pampas valued at 1½ to 2 pesos sold in Córdoba at 4½ and in Salta at 8 to 8½ and exceptionally 9. Pasturing in Córdoba cost 5 to 6 reales (8 reales to 1 peso) per head with a refaction of 6 mules per 100; in Salta 1 peso per head. Wages paid were for the first stage 12 to 16 pesos, silver, with meat and Paraguay tea; for the second stage 70 pesos to the captain, 30 to his chief assistant, 20 each to the peons, with a steer every two days, Paraguay tea, tobacco and paper for cigarettes. For the third stage the wages varied according to the distance. For the captain it was 300 pesos up to Oruro, 500 to Cuzco or the Tablada de Corporaca, 850 to Jauja or the Tablada de Tucle; for the chief assistant the wages for these respective distances were 160 to 170, 225, and 360 pesos and for the peons 65, 120, and 175 pesos. Other expenses, the cost of horses, and losses would bring up the expenses of the trade.

Ulloa says[12] that 25,000 to 35,000 mules were pastured on the meadows of Canas, on the Tablada de Corporaca, and there sold in the great annual fair. Considerable numbers, too, found their way to the coast valleys, where, on the alfalfa pastures, they were so much better nurtured that they were good for four times as much work as in the mining districts of the plateau.

Colonial Salta, then, figures as the center of a commercial movement whereby tens of thousands of mules were annually transported from the plains to the plateau. Underlying the movement may be found the principle that dominated the whole colonial economy—exploitation of the precious metals.

Upper (post-revolutionary Bolivia) and Lower Peru constituted a vast territory over which population distribution was controlled most forcefully by mineral wealth. Practically all the Spanish towns, at least of Upper Peru, owed their existence directly or indirectly to mining. The mines were situated at great altitudes and often in remote and almost inaccessible spots. Today, even, nearly half of the Bolivian towns are at elevations exceeding 12,000 feet.[13] To support a population concentrated in places where cultivation was either limited or altogether impossible, agricultural settlements grew up in the valleys and basins. The classic example of this dependence —abnormal in the early development of a colony—is Potosí. Potosí stands on bleak mountain slopes at an altitude of 13,388 feet. During the days of its prosperity it was far and away the largest town of the western hemisphere; in the mid-seventeenth century it had a population of 160,000. The city drew its sustenance from a wide area, extending northwards to include Arequipa and its coast valleys and southwards to the Chilean valleys beyond the most arid section of the Atacama Desert (thus Chañaral, a "precious oasis of the desert," was, in 1678, granted with "all its waters" for the establishment of pastures for feeding the mules that carried cargoes of brandy to Potosí[14]), and eastwards to the Cuzco basin and *montaña* valleys. One of the chief contributors was La Paz, founded as a station on the road but prospering in virtue of its maize and bean fields and its advantageous location. Another was Cochabamba, typical of the fertile and climatically blessed basin towns of the eastern Andes.

The conveyance of the products from these various regions involved questions of transportation. A continual stream of laden beasts toiled into the great market place of Potosí. On smaller scales similar phenomena obtained elsewhere. Means of transportation were also required for the shipment of the minerals to the coast. Thus very early in colonial days were created problems of communication in a region where today, more than three centuries later, over-difficult transportation remains the supreme

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12 Antonio de Ulloa and Jorge Juan: Relacion Historica del Viaje a la America Meridional, Madrid, 1748.

13 Isaiah Bowman: The Distribution of Population in Bolivia, *Bull. of the Geogr. Soc. of Philadelphia*, Vol. 7, 1909, pp. 74-93.

14 C. M. Sayago: Historia de Copiapó, Copiapó, 1874, p. 83.

obstacle to progress. The navigable rivers were in the wrong places, and roads for wheeled traffic there were none. Transport was limited to the beast of burden, including man. The Indian, however, performed this service only to a limited extent and in the most inaccessible spots, even as he does today in certain mining districts.[15] The only other native beast of burden was the llama, a hardy and economical animal, but leisurely of movement and unable to carry heavy loads.[15] European beasts had been introduced by the Spaniards. Of these one was pre-eminently fitted for the onerous labor of transportation. The mule, acclimated even better than the llama to the variation of altitude and climate from plateau to coast, could carry larger cargoes at greater speed. Unfortunately the horse, one parent of the hybrid mule, is raised with difficulty at great altitudes. Only in the temperate basins of the plateau can horse-breeding be prosecuted successfully, and these areas, of which Cochabamba is illustrative, are limited.

Peru, then, was compelled to look afield for her supply of mules. Her demands were abundantly met on the unrivaled pastures of the La Plata Provinces. The chief features of the trade have been already indicated. In common with the general trade of the country it was characterized by periodic movement and maintenance in a system of fairs, principles of trading that still flourish in economically undeveloped South America. Between the regions of supply and demand intervened great spaces of difficult country that could not be crossed at a single stretch and along which adequate pasturage was only to be found at intervals. Seasonal variations of climate likewise restricted movement and encouraged periodic traffic, as in Russia the ice-bound condition of the rivers during the winter has concentrated commerce in the summer season and favored the development of trading by fairs. Under these controls the road from the pampas proceeded in as direct a line as possible to the comparatively well-watered Sierra de Córdoba and thence skirted the long line of Andean foothills through the settlements of Santiago del Estero and Tucumán to Salta, taking this second stage at a climatically suitable season.

Bustamante's old guide tells of an alternative route occasionally followed. It proceeded more directly north to economize on the pasturing season in Córdoba. Gathering mules from Santa Fé and Corrientes it passed through the eastern part of Santiago province fringing the southern Chaco country. But the mules had to be three and one-half to four years old before they could make the journey and needed a longer period of recuperation at Salta. A larger stock of provisions had to be carried, and the road was somewhat exposed to the attack of savage Indians; yet the greatest risk of

[15] An Indian carries 50 to 100 pounds, for short distances up to 300 pounds, and with a light cargo travels 18 to 25 miles a day. A llama carries 50 to 100 pounds and rarely travels more than 10 miles a day. A burro carries 100 to 150 pounds and travels 20 miles, a mule 200 to 300 pounds—normally the former—and travels 35 to 45 miles a day for journeys not exceeding 5 or 6 days—25 to 30 for longer distances. (W. L. Sisson: Informe sobre . . . de Ferrocarriles Bolivianos, La Paz, 1905, pp. 143-144.)

all was encountered from the hydrographic peculiarities of the region—either scarcity or superfluity of water. Along the main line of travel dangers of molestation were not great except in the transition zone, where a check was maintained by Salta and its dependent forts. A few leagues from Salta the fort of Cobos had been erected as an outpost against the Chaco Indians. Its garrison was supported by the excise fees on each head of mule leaving the town.

In addition to these circumstances conditioning trade in general, the peculiar features of traffic in live-stock rendered it particularly adaptable to the "fair" system. Fairs of live-stock are those which, retaining their ancient characteristics, have everywhere survived longest. Their business is done in produce that can be walked to market, distance being no insuperable obstacle. They deal in commodities that can most advantageously be purchased by direct and personal communication between buyer and seller.[16] Under such considerations Salta, lying in the transition zone (Fig. 4), was the natural site for the fair, for it was the natural meeting place between buyer and seller. Most important of all, the alluvial and well-watered flats of the main valley provided ample pasturage, the first requisite of the live-stock fair. However undesirable their properties from a hygienic point of view, the meadows of Salta were unquestionably excellent for the fattening of beasts. Pedro Lozano [17] speaks of their virtues with appreciation: "The admirable pastures so fatten the beasts [cattle] that from each one is taken at least six arrobas (150 pounds) and at times two quintals (224 pounds) of fat and tallow, from which with the ashes of a plant called 'vidriera' is made a rich soap that sells in Potosí at a considerable profit." Thus the pastures localized the trade and the fair.

The Wars of Independence and the Decline of the Salta Trade

In the latter half of the eighteenth century traffic along the Lima-Buenos Aires road began to decline. The output of silver from the Bolivian mines had decreased.[18] Buenos Aires, erected into a Viceroyalty in 1776 and with other South American colonies granted free trade for its port (1778), was relieved of economic dependence on Peru. The chief link binding the remote governments was broken. Reduction of traffic between them found a response in diminished security along the road; the Pampas Indians commenced the invasions and depredations that lasted uninterruptedly until their final subjugation was accomplished by General Roca in the campaign of 1879.

[16] See notes on "An Old-Established Fair in Modern France" and "Russian Fairs" in this number under "Geographical Record."

[17] Pedro Lozano: *op. cit.* under 3, Vol. 1, p. 276.

[18] During the first half of the seventeenth century the acknowledged annual production of silver from Potosí was, with one or two exceptions, over 5,000,000 pesos: during the corresponding period of the eighteenth century the average was under 2,000,000 pesos. (Razon certificada que se envio a Carlos III de las sumas que por los Reales derechos de Quintos y Diezmos . . . del famoso cerro de Potosí desde el año 1536 . . . hasta 31 de diciembre de 1783 . . . D. Lamberto de Sierra, *Colección de Documentos Inéditos para la Historia de España*, Vol. 5, Madrid, 1842-44.)

But the great blow to Salta's trade fell with the Wars of Independence. Then the province experienced in full the disadvantages attendant on its frontier location. It bore the brunt of the Royalist attack from the plateau and by the successful and gallant defense of its gauchos fully earned its title, "shield of Argentina." Close to Salta town itself is the field of Castañares, where in 1813 Belgrano vanquished the Royalist forces. The conclusion of the wars left Salta in an unhappy condition; not only had trade been suspended and markets extinguished or reduced but much havoc had been wrought amongst the live-stock, the produce upon which Salta was absolutely dependent. Andrews, who traveled through the country in the early twenties, describes Salta as relying on the surrounding provinces for articles of the commonest necessity[19] "possessing the finest timber, it is tributary to Tucumán for household furniture and even boards; with cotton indigenous, to Catamarca for candlewicks; to Santiago del Estero for dyes and wax; to San Juan and Rioja for wine and brandy; . . . for common earthenware utensils they are indebted to the Matacos Indians." The only attempt at cultivation seems to have been the sugar plantations, but these were few in number and operated so uneconomically that the product could not compete with the imported article.

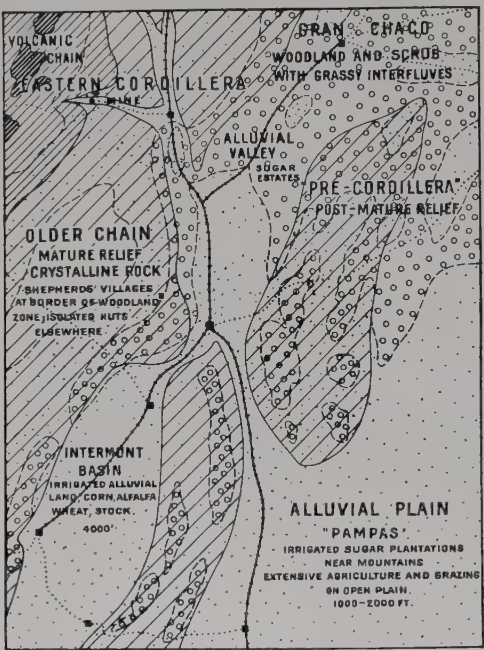

FIG. 4—Regional diagram of the eastern border of the Cordillera in the latitude of Salta.*

Salta under the Republic

Though an integral part of the Argentine Republic, from the establishment of independence to recent days Salta has enjoyed far closer relationship with the republic over the northern border, Bolivia. Salta lies in the

[19] Captain Andrews . . . : Journey from Buenos Ayres . . . to Potosí . . . , to Arica . . . , to Santiago de Chili and Coquimbo undertaken on behalf of the Chilian and Peruvian Mining Association in the years 1825-26, London, 1827, p. 302.

* For an explanation of this type of diagram, with other examples, see note on pp. 424-425 in the June *Review*. The darkest shading represents steep snow-covered country; the next lower grade represents rough but snow-free country; the lightest shading represents moderate relief; and no shading represents plain or plateau. Small circles represent forest or woodland; dots represent pastoral or agricultural land.

transition zone between two great topographic and climatic regions. One of the factors contributing to the development of the town is the topographic break that necessitated a change in the methods of communication. Across the pampas oxcarts and coaches were used; at Salta change was made to mule-back for the plateau and its ascent. From the productive point of view, Salta, in common with the rest of the Argentine, was a pastoral region with agricultural potentialities (Fig. 4). The Bolivian plateau, with its mineral wealth, constituted an entirely different world. The difference has been well expressed by Huret.[20] Describing La Quiaca, on the upper edge of the plateau, he says "here it is no longer a question of cattle, nor corn, nor hectares, nor sugar, nor vegetables, as in Buenos Aires and Tucumán. Truly are we in another country. The only concern is the discovery of mines." Between two such complementary regions as Salta and Bolivia some degree of community was inevitable. And exchange was not limited to resources: it extended to the people. The frontier character of Salta is clearly evidenced in the prevalence of Quechua blood and language, sympathies and customs. The great native rebellion of 1780 that broke out north of the Titicaca basin gained the provinces of Salta and Jujuy. Today there is a considerable number of Bolivians in these frontier provinces. In Jujuy they constitute about eight per cent of the population according to the census of 1895.

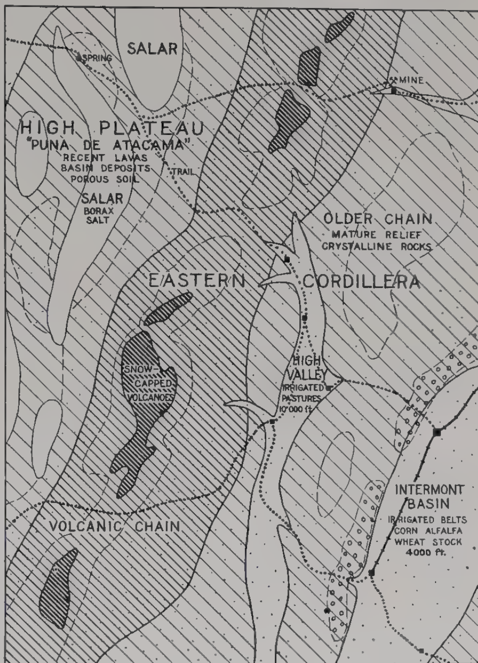

FIG. 5—Regional diagram of the Eastern Cordillera of northwestern Argentina showing typical high-valley environment.

Isolated from Buenos Aires and the La Plata Provinces,[21] Salta turned to the plateau (Fig. 5). Though the demand for mules was diminished, Bolivia and Peru continued to afford a not inconsiderable market for the old-time product, and changes began to develop in respect both of markets and products. The revolution that had finally opened South America to

[20] Jules Huret: En Argentine: De Buenos-Aires au Gran Chaco, Paris, 1912, p. 248.

[21] Temple says that in his journey of 1826 from Buenos Aires to Salta, a distance exceeding 1,200 miles, he met with travelers on four occasions only. Edmond Temple: Travels in Various Parts of Peru, including a Year's Residence at Potosí, London, 1830, p. 211.

world trade gave a tremendous impetus to Chilean mining, in particular of copper.[22] Prices of metal increased and costs of working diminished. Deposits hitherto unprofitable could be worked on a practical basis. Pros-

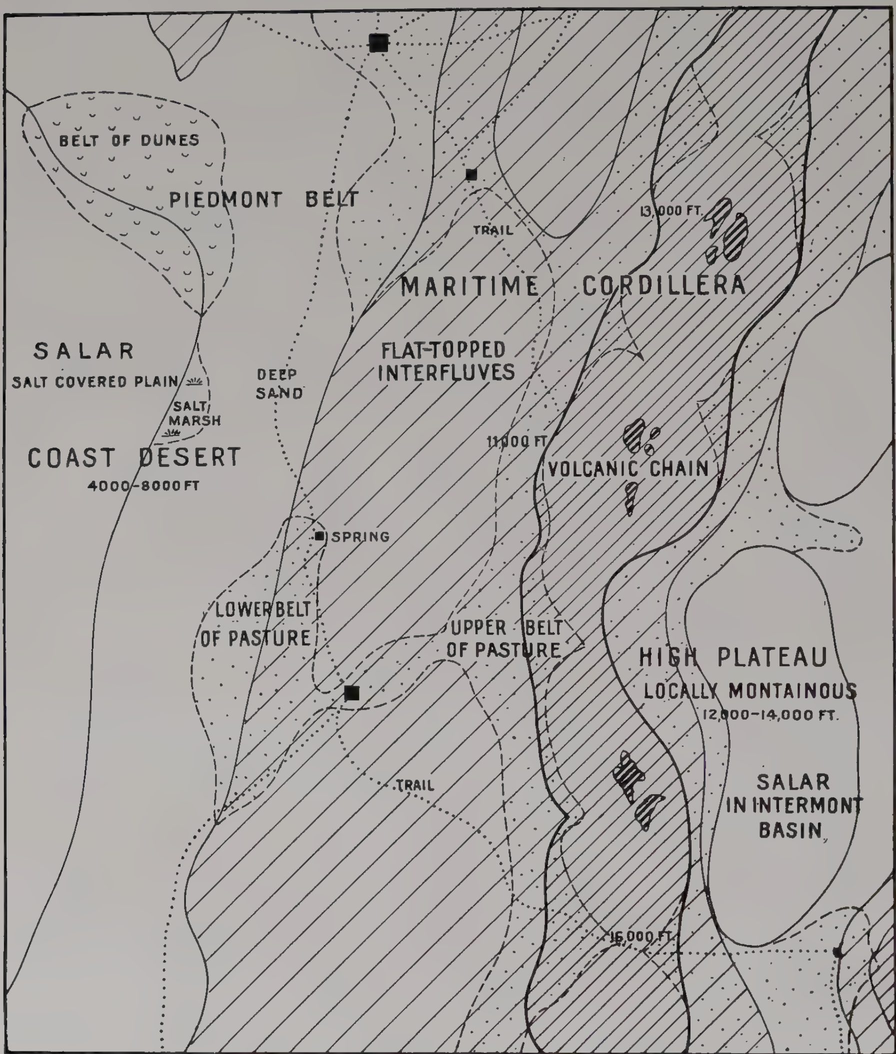

FIG. 6—Regional diagram of the western border of the Cordillera showing the elements of the physical environment at San Pedro de Atacama.

pecting and exploitation in new fields progressed apace. In the mid-century a further stimulus arose with the development of west coast shipping consequent on the discovery of gold in California. Expansion of ore mining in Atacama was followed by the beginnings of nitrate exploitation in the

[22] Basil Hall: Extracts from a Journal written on the Coasts of Chili, Peru and Mexico in the years 1820, 1821, 1822, Edinburgh, 1824.

more northerly provinces. To this activity Salta had a twofold relationship, industrial and commercial. The Salta peon went to work in the mines and nitrate fields: trade flourished across the Andes, and on the Argentine side Chilean currency began to circulate as freely as Bolivian and both more

FIG. 7—General map of the Salta region showing, with Figure 1, all locations mentioned in the text.

generally than that of domestic denomination. On the Chilean side the channels of trade concentrated in the desert ports of Copiapó and Cobija.

While details of trade between these ports and Salta cannot be stated with any assurance, for statistical information relating to the period is necessarily deficient, the data cited by Moussy[23] from official sources is at least indicative of the general trend of trade.

[23] V. Martin de Moussy: Description de la Confédération Argentine, 3 vols., Paris, 1864; ref. in Vol. 3, p. 274.

TRADE OF SALTA FOR DECADE 1845-1854
(in *piastres fortes*)

	Export	*Import*	*Total*
With Bolivia	1,519,149	15,507	1,534,656
With the Pacific coast	188,158	1,736,169	1,924,327
With the Argentine littoral	123,627	529,100	652,727

From Bolivia the chief articles of import were coca, chocolate, coffee, and straw hats—the produce of the warm valleys. The exports were mules, cattle on foot, goats, mares, asses, hides. The mules totaled 63,092, about a single year's export on the industry at its apogee. From the Pacific coast the import was European merchandise. Between Salta and the rest of the Argentine Republic the import was maté and goods of foreign manufacture, and the export was hides and chinchilla skins. The figures, however, make no allowance for contraband trade, which, especially in the two former routes, must have been carried on very extensively. Today coca, forming about half the export from Bolivia to Argentina and rated high in the scale of tariff, is smuggled across the frontier by devious routes through Lipez and the Puna de Atacama. According to official authority the figures quoted must be increased by thirty per cent. Nevertheless they clearly demonstrate the weak bond of trade between Salta and the Rio de la Plata. As late as 1886 similar conditions are manifested. For this year the value of animal products—hides, prepared leather, goat and kid skins, and wool—, transmitted from the northwest provinces to Buenos Aires via Córdoba, amounted to $9,396 in the case of Salta and $3,836 in the case of Jujuy, i. e. from the two together $13,232. Exportation from the same provinces to Bolivia totaled $157,503.[24] It comprehended 9,829 sheep, 8,558 burros, 2,945 mules, 1,000 horses, and 4,275 cattle. The figures for Salta and Jujuy are not given separately, but the former province was much the larger contributor. A significant feature of the list is the relative and increasing importance of the cattle export. This is one of the notable modifications of the Salta trade; another is the already noted development of new routes and markets.

The old route to Bolivia and Peru via Jujuy and the Humahuaca *quebrada* now encountered competition from the two new roads to the Pacific. These followed in part ancient trails by which the Indians of the puna and its high *quebradas* brought down their salt, goat skins, and woven fabrics to barter for the produce of the warmer valleys (Figs. 5 and 8). Thence they crossed the Atacama Desert to Copiapó and Cobija (succeeded later by Antofagasta) respectively.[25] The former or southern route passed through the Calchaquí Valley, creating in Molinos a commercial station of some importance, and thence, skirting the southern *salars* of the puna,

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[24] F. Latzina: Geográfia de la República Argentina, Buenos Aires, 1888. p. 463.

[25] For details of roads crossing the Cordillera see Santiago Muñoz: Jeografía Descriptiva de las provincias de Atacama i Antofagasta, Santiago de Chile, 1894, p. 63 *et seq.*; Franz Kühn: Descripción del Camino desde Rosario de Lerma hasta Cachi, *Bol. Inst. Geogr. Argentino*, Vol. 24, 1910, pp. 42-50.

entered Chile by way of the passes of San Francisco and Tres Cruces. The more northerly route passed through the ancient copper mining site of San Antonio de los Cobres, the stretch of "Despoblado" to the oasis of San Pedro de Atacama, and thence across the Atacama Desert to Cobija. The routes were approximately the same length—500 miles, requiring about twenty days for accomplishment. Both were arduous. Between Salta and the Pacific seaboard intervene the cold desert of the puna (Fig. 6) and the warm desert of the coast. Throughout the routes water, fodder, and fuel are only encountered at intervals. The water is generally of poor quality, brackish, the fodder in certain localities unfortunately distinguished by the presence of grasses poisonous to all save *criollo* beasts; and the third necessity, fuel, limited to the resinous *yareta* and the various species collectively known as *tola,* has been largely denuded from the well-beaten tracks. But the greatest trial of all lies in the atmospheric conditions. In average altitude the puna ranges between 11,000 and 12,500 feet. Its heights rise to 20,000 feet and more, and some of its high western passes reach 16,500 feet, as for instance the terrible Alto de Lari on the Antofagasta road where "thousands of head of cattle have left their bones"[26] (Fig. 9). Over its bare and saline surface sweep frequent, in summer almost daily, storms. Those of winter are indeed less numerous but they are more demoralizing, and the night temperatures of the colder season are excessively low. Many an entire troop has succumbed to the dread "white wind" of the puna.[27] The reports of the first Spanish crossing of this region, Almagro's famous exploit, vividly detail the perils of the road.[28] Yet despite the hardships the routes were shorter and communication less interrupted and cheaper via the Pacific than the Atlantic. Page[29] of the United States Naval Expedition of 1859 investigated navigation on the Rio Salado (Santiago Province) and estimated that if practicable it would reduce the round trip from Salta to Rosario (distant 350 leagues by road) from eight or ten months to two and the expenses by half. At the time of his investigation freight charges along this route amounted to \$2.00–\$2.50 per *arroba* (25 pounds) while from Cobija they ranged from \$1.50–\$2.00.

Modern Salta

Towards the end of Argentina's great decade of railroad building, 1880-1890, the railroad arrived at Salta and Jujuy, and for these provinces the modern era may be said to have begun. The railroad traffic returns of the Ferrocarril Central Norte, the line connecting Salta and Jujuy with Tucumán, for so early a date as 1895 are significant. The values, given in

26 Juan B. Ambrosetti: Viaje á la Puna de Atacama, *Bol. Inst. Geogr. Argentino,* Vol. 21, 1903, pp. 87-116.

27 For a graphic description see Alejandro Bertrand: Memoria sobre las Cordilleras del Desierto de Atacama i Rejiones Limítrofes, Santiago de Chile, 1885.

28 Historia de Copiapó, *op. cit.* under 14, or original sources: Garcilaso de la Vega: Historia General del Peru, 2nd edit., Madrid, 1722, Vol. 7, Chapter 13; Antonio de Herrera: Historia de las Indias Ocidentales (Decade V, p. 190), Antwerp, 1728.

29 Thos. J. Page: La Plata, the Argentine Confederation, and Paraguay, New York, 1859, p. 414.

FIG. 8—Typical landscape of the higher *quebradas* west of Salta; in a tributary of the upper Calchaquí (Cachi) Valley above La Poma. The shepherd's grass-thatched stone hut and corral are at 12,100 feet. Similar habitations are found up to 15,000 feet, but seldom above, for although pasture runs up to 16,000 feet, there is easy access to the lower valleys. The cactus that forms so conspicuous a feature of the landscape has a vast range of utility; it furnishes the...

tons, are: hides and skins, 1,139; flour, 2,584; sugar, 9,020; tobacco, 653; rice, 285; *aguardiente*, 803; wine, 797; lime, 3,983.[30]

The list is suggestive of a new economic outlook for Salta. The northern and western part of the province, occupied by puna and high valleys, must, it is true, remain ultimate grazing and mineral land, but the lower valleys, Calchaquí, Lerma, and the eastern plains extending over to the Chaco and with an elevation of only 300 feet, are adapted for cultivation of a wide range of temperate, sub-tropical, and tropical products (see Figs. 4 and 5). The Lerma Valley, 37 miles long and 15½ miles wide at an elevation of 3,937 feet, with alluvial soil and abundant opportunities for irrigation, has splendid possibilities. As yet Salta has not been in touch with outside markets long enough or fully enough to have more than begun the development of its agricultural and forestal resources. Only one-half of one per cent of the total area of the province is under cultivation. The staple product of Salta is still her staple of three centuries ago—live-stock, the typical frontier product. Increased acreage devoted to alfalfa has promoted the raising of cattle, at the expense of mule breeding and pasturing. For the cattle trade, as formerly for the all-important mule trade, the Lerma Valley remains the great gathering ground. Cattle brought from the Chaco are turned into the alfalfa meadows and cornfields to be fattened for the Cordilleran journey. Córdoba, that also retains some of its old-time business, sends many cattle to be sold on the Salta market. The locus of the great fair has been moved from the immediate confines of the town to Sumalao, a hamlet 24 miles or so to the south, where a big annual market is held in July.[31]

Besides the Lerma Valley and its tributary areas many small stock-raising establishments exist in the western *quebradas* of Salta and Jujuy and the recently created territory of Los Andes. They specialize in the fattening of stock for the Bolivian and Chilean markets. Brackebusch[32] has described the felicitous circumstances of Yavi on the Puna de Jujuy in consequence of its alfalfa pastures. In comparison with the neighboring hamlets of the puna it appears as "a veritable oasis." Here cattle and mules are pastured en route to the fairs of the Bolivian plateau. In this and similar locations an additional advantage is gained for the beasts by the period of rest. They are gradually acclimated to the change in altitudes and its attendant modifications.

In the territory of Los Andes the La Poma Valley offers a typical illustration of this phase of pastoral life.[33] La Poma is a hamlet of the upper Calchaquí (Cachi) Valley. Its elevation above sea-level is 10,000 feet. Five hundred hectares of the valley are under cultivation, some under wheat and barley but the major part under alfalfa, that at this high altitude

[30] Anuario de la Dirección General de Estadística correspondiente al año 1895, Buenos Aires, 1896, Vol. 2 p. 341.

[31] Paul Walle: L'Argentine telle qu'elle est, Paris, [1912], p. 358.

[32] Ludwig Brackebusch: Viaje á la Provincia de Jujuy, Buenos Aires, 1883 (?), p. 48.

[33] Isaiah Bowman: Manuscript field notes of South American expedition of 1913.

flourishes amazingly well. Resowing need only be performed every twenty-five years, whereas in the lowlands of the Rio de la Plata it is a triennial operation. Live-stock is raised in the valley. Each small tenant farmer has a few beasts that he grazes on the steeper slopes above the alluvial patches. During the summer the valley is invaded by herds and troops from Catamarca and the adjacent provinces. An estimate places their number at 3,000 mules, 4,000 burros, and 3,000 cattle. They are pastured here and then pass on to the usual markets. A few of the natives make mule journeys into Bolivia for coca; some carry salt and borates from the *salars* of the Puna to the plains, but the pastoral business constitutes the main life of La Poma's six hundred inhabitants.

Luracatao, in a tributary valley of the Calchaquí, has a like reputation. It sends some three hundred head of cattle per month to Chile. They go in troops of sixty head, traveling about nine to twelve miles per day and going to markets even as far north as Iquique. The large-boned, large-hoofed beasts, shod for the journey, are of a type well fitted for such travel, but even they, especially during the winter, arrive in a very flaccid condition. It is estimated that they lose one hundred pounds on the road.[34]

The northern provinces of Argentina have to face the competition of the south in their Chilean trade. From Copiapó south the Chilean valleys are sufficiently well watered to engage in pastoral industry, in particular the fattening of stock for the mining and nitrate zones. It is reported that ten thousand head of cattle cross from Catamarca, Rioja, and San Juan to the alfalfa meadows of the Huasco valley alone.[35] Still farther south a new source of competition has been developed by the trans-Andine railroad. A comparison of the degree of the traffic along these several routes would be of considerable interest, but unfortunately reliable statistics are wanting.[36] During the first few years of the present century an obstacle was put in the way of cattle exportation from Argentina to Chile. Animals on foot formerly permitted to enter free of duty were subjected to increasingly high tariffs with the object of protecting the pastoral industry in the southern part of Chile. The greatest sufferers, however, were the mining centers and nitrate fields; for landing of the cattle from southern Chile frequently could not be effected for months at a time, and the impost was shortly removed.

The Future of Salta

With the completion in the near future of the Tupiza-La Quiaca railroad[37] the last link will be made in the iron road from Buenos Aires to Lima. Between the united republics is anticipated a great trade stimu-

[34] Eduardo A. Holmberg: Viaje por la Gobernación de Los Andes, Buenos Aires, 1900.

[35] L. J. Morales: Historia del Huasco, Valparaiso, 1897, p. 264; also Isaiah Bowman: Results of an Expedition to the Central Andes, *Bull. Amer. Geogr. Soc.*, Vol. 46, 1914, pp. 161-183.

[36] On the discrepancies between official figures of cattle imports from Argentina into Chile during the period 1901-1908 see Ricardo Pillado: Estudio sobre el comercio Argentino con las naciones limítrofes, Buenos Aires, 1910, p. 107.

[37] See note on the "Condition of the Pan-American Railroad between Buenos Aires and Lima" in the February *Review* (Vol. 1), p. 53.

lation in which the provinces of Jujuy and Salta should have a prominent share. Projects have also been discussed for connecting Salta with the Pacific by a trans-Andine line to Antofagasta and with the Paraguay River by a railroad through Formosa. The development of important cross roads in this extreme northwestern corner of Argentina seems inevitable, for it lies in a transition zone from east to west as well as from north to south. Somewhere in the region a great central mart must spring up. Salta, in virtue of its geographical "momentum," may become such and retain its present position of chief population center north of the zone of influence

FIG. 9—Near the pass at the western border of the Puna de Atacama above Soncor; see map, Fig. 7. Elevation 15,000 feet. The herd of cattle shown are from the Gran Chaco on the eastern border of the Andes. They were fattened at Salta and are now en route for the nitrate fields of northern Chile.

of Tucumán. Jujuy on the direct rail route threatens to be a powerful rival and is regarded by Salta with jealous eyes. The latter, however, has accomplished notable progress and improvements during the last few years and has grown vigorously. The population, rural and urban, given by the 1869 census as 16,877 and by the 1895 census as 20,361, is now estimated to be little short of 30,000.[38] The town of Salta has outgrown the appearance of a village and has become a modern city. It reckons among its people no longer merely the provincial, but also the cosmopolitan. Comfort and luxury have come in with the modern rise in land values. It is destined to become one of the greater cities of future Argentina.

38 Results of the census of 1914 are to be published very shortly.

PIRATE COASTS OF THE MEDITERRANEAN SEA*

By ELLEN CHURCHILL SEMPLE

It is rather a significant parallel that the German and Austrian submarines, the commerce destroyers of the present war, frequent the same hunting-grounds in the Mediterranean as the ancient and mediaeval corsairs. They have been operating in the Iberian Sea, which forms the broad avenue leading to the Gibraltar gate; along the marine highway between Spain and the Balearic Isles, traveled by ships bound from Gibraltar to Marseilles; in and about the Sicilian Strait, where converge all lines of traffic between the eastern and the western basins; in the Strait of Otranto and the long Adriatic lane; in Cretan waters, which form the passways to the Aegean; and along the approaches to Alexandria and the Suez Isthmus.

The Mediterranean Sea has been the oldest and in some respects the greatest European training school of maritime activities. These it has coddled and guided and stimulated by a rare combination of geographic conditions. From time immemorial its coasts have sent out fishing fleets into all parts of the basin. From the days of the Cretan Minos it has produced a long succession of sea powers whose navies have sailed its waters far and wide and whose merchantmen have traded in its remotest ports.

A sinister form of maritime activity is found in the piracy which for ages was a recurrent phenomenon on many shores of the Mediterranean. It constituted a lawless combination of naval aggression and maritime commerce, seizure and sale without the formality of purchase. The blend of piracy and trade among early Phoenicians, Greeks, and Etruscans belonged to a primitive, undeveloped period when warfare was chronic, when stranger meant enemy, and when buccaneers executed a crude form of navigation act designed to crush competition in the markets of the home sea. Such undoubtedly was the attitude of the ancient Etruscan pirates toward Greek and Carthaginian ships which ventured to sail the Tyrrhenian Sea. They asserted the priority of their claim to those waters by attacking the coast and island settlements of the Greeks in the vicinity, with the purpose of discouraging encroachments upon their maritime preserves.[1] Piratical attacks were especially common in the Aegean when many of the Cyclades islands were occupied by Carians and perhaps by Phoenicians, and when national antagonisms emphasized commercial rivalry on the sea. Finally the Cretan Minos employed his naval power to conquer these islands, suppress piracy, and protect the revenues from his maritime empire, so that commerce by sea became more general.[2]

The decay of Cretan sea power after the Dorian invasion made possible

* A chapter from a forthcoming book on "Geographic Influences in the Ancient Mediterranean Basin."

[1] Mommsen: History of Rome, Vol. I, pp. 181-182 and 186. New York, 1905.

[2] Thucydides, I, 4-8.

the revival of piracy in Homeric times,[3] and converted the former police of the Aegean into wide-ranging corsairs. A passage in the Odyssey indicates that it was not an uncommon event for Cretan freebooters to carry off plunder from the Egyptian coast.[4] Homer represents the Phoenicians as kidnapping men and women to sell as slaves. Taphian pirates, Greek natives of a small island group off the west coast of Acarnania, stole a Sidonian woman and sold her to a Syrian prince. Both Taphians and Cretans, in Homeric times, were more corsairs than traders, and both were skilful mariners.[5] When seamen landed on a strange coast, they were asked, quite naturally: "Outlanders, whence come ye? Are ye robbers that rove the sea?" The general custom of slaying shipwrecked mariners,[6] on the assumption of their being pirates, points to the prevalence of the evil in the Mediterranean in legendary and early historical times.

The conspicuous fact in Mediterranean piracy is its repeated recrudescence whenever maritime political control is relaxed, and especially its constant recurrence, from the dawn of history down to the nineteenth century, in certain coast districts which are natural breeding places of sea-robbers. The stable factors tending constantly to produce this phenomenon are to be found in the geographic conditions obtaining in the Mediterranean. Owing to the configuration of the basin, traffic was compressed into certain narrow trade routes. These threaded their way between island and peninsula, entered sub-basins by the only possible gateway of the strait, and, when bent upon tapping the hinterland trade, concentrated on ports like Massilia and Alexandria, commanding the few breaches in the barrier boundaries of the Mediterranean. Thus traffic was restricted to fixed lines in a way impossible on the open ocean.

The sea hunter, therefore, knew various points where he was sure to bag his game. The pirate was the robber of the sea highways; and the highways of the Mediterranean were well defined and well traveled. The Oriental commerce in slaves and luxuries yielded such rich plunder to the freebooters, as it passed through Cretan waters between the Peloponnesus and Cyrenaica, that the pirates called this "the golden sea."[7] Just such geographically determined routes attracted the buccaneers of the American Mediterranean in the seventeenth century, as they swarmed out of their hiding places in the Antilles, to seize the gold and silver freight of the homebound Spanish caravels or the useful cargoes of the outbound ships. Here Jamaica, owing to its location, played the part of Crete as an advantageous piratical base; for it commanded several marine passages into the Caribbean Sea and was within striking distance of the Spanish treasure ships as they left the Isthmus of Panama and the Mexican ports.[8]

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[3] Keller: Homeric Society, pp. 92-93. New York, 1902.
[4] Odyssey, XIV, 245 *et seq.*
[5] Odyssey, I, 181-185, XV, 426; XVI, 426; Strabo, Bk. X, Ch. II, 20; Herodotus, I, 2.
[6] Herodotus, IV, 103; Strabo, Bk XVII, Ch. I, 6, 19.; Vergil: Aeneid, III.
[7] Mommsen: History of Rome, Vol. IV, p. 309. New York, 1905.
[8] David Hanney: The Sea Trader, pp. 234 and 244. Boston, 1912.

The Mediterranean afforded a profitable field for the pirate, furthermore, because the wealth of the bordering lands lay within reach of his pillaging expeditions ashore. Owing to the prevailing rugged relief, the consequent paucity of land roads, the importance of "the wet ways" for communication and transportation, the scarcity of level land for cultivation, and the general discouragement of the barrier boundaries to inland expansion, population was concentrated on the coastal hems and small deltaic plains near the sea. Piratical raids upon these littoral communities forced the very early inhabitants of Greece, Thucydides tells us, to locate their cities from two to ten miles back from the shore.[9] Farther than this the pirates dared not penetrate, lest their escape should be cut off. The location on the inner edge of the coastal zone characterized not only the most ancient Greek cities, like Athens, Argos, Tiryns, Mycenae, Megara, and Corinth, but also the earliest Cretan towns and palaces of the Minoan period, such as Cnossus, Phaestus, Gortyna, Lyttus, and Praesus. These lay several miles back from the shore where each maintained a port or naval arsenal.[10]

The same cause and effect are manifest also in the western Mediterranean. The Etruscans, owing to their nautical efficiency, might have risked coastal settlements; yet as a matter of fact they placed their earliest towns several miles from the shore. Such was the location of Pisa, twenty stadia up the course of the Arno, which even in historical times was exposed to robber raids from Sardinia.[11] Such was that of Vetulonium, Volci, Caere, and Tarquinii on the Tyrrhenian littoral, as well as Spina and Atria, their Adriatic ports.[12] Strabo makes the generalization that the founders of the early Etruscan cities, as opposed to later ones, either avoided the coast or merely built fortifications there as defenses against pirates. The only exception which he found to this rule was Populonia (Piombino), located on the walled summit of a lofty promontory, with its little port on the inlet at the base.[13] But this possibly was no exception after all, for Populonia may have been originally one of the earliest Greek factories which temporarily occupied several capes and islands of the Etruscan coast, until their occupants were dispossessed by the native inhabitants.[14]

The necessity of occupying these salient points as coast defenses against the maritime Greeks, and their own growing sea power, drew the Etruscans coastward. They occupied also the promontories of Antium, Circei, and Surrentum on the coast of Latium and Campania and utilized them as pirate strongholds from which to conduct their depredations.[15] Fearing these attacks, the agricultural Latins located their most ancient villages at

[9] Thucydides, I, 7.
[10] Strabo, Bk. X, Ch. IV, 7, 11-14.
[11] Strabo, Bk. V, Ch. II, 5, 7.
[12] Mommsen: History of Rome, Vol. I, pp. 160-161, 179. New York, 1905. Pliny: Natural History, III, 20.
[13] Strabo, Bk. V, Ch. II, 6.
[14] Mommsen: History of Rome, Vol. I, pp. 177-178. New York, 1905.
[15] *Ibid.*, Vol. I, p. 181.

a respectful distance from the sea, even those like Lavinium, Laurentum, and the Rutulian Ardea, which belonged to the coastal zone.[16]

With the general development of maritime activity in the Mediterranean, the consequent decrease of piracy and increase of oversea colonization, sites on the outer edge of the littoral were selected for their ready access to commerce. Such of the older towns as were not too far from the seaboard established there each its own port. Thus there developed twin cities, port and capital, such as Rome and Ostia, Troezene and Pogon,[17] Athens and the Piraeus, Gortyna and Leben in Crete,[18] Cythera and Scandia in the island of Cythera,[19] and countless other primitive towns of inland location. Many of these felt the necessity of securing their connection with the sea against interruption in time of war and therefore built "long walls" like those which enclosed the thoroughfare between Athens and the Piraeus. Similar "long walls" connected Megara with its port of Nisaea[20] on the Saronic Gulf, Corinth with its port of Lechaeum on the Corinthian Gulf,[21] and were projected by Argos to ensure its communication with the sea at Nauplia in the Peloponnesian War, but when half finished were destroyed by the Spartans.[22]

The decline of Roman sea power in the last decades of the Republic led to a widespread recrudescence of piracy. The freebooters were emboldened to seize many coast towns and to carry their pillaging expeditions farther inland than ever before. Therefore the Gabinian Law, enacted in 67 B. C. for the suppression of piracy, conferred upon Pompey the dictatorship over the sea and over a coastal zone fifty miles wide, in order to include all the seaboard holdings and the inland refuges of the pirates.

The coastal population which was drawn shoreward when the seas were safe from marauders retreated anew to the interior on the revival of the buccaneer's trade. Thus the southern littoral of Italy, which was the site of flourishing seaboard settlements during the period of Greek colonial expansion, became wellnigh depopulated during the Middle Ages, owing to the century-long attacks of the Vandal, Saracen, and Algerine pirates,[23] who swooped down from the African coast, and the depredations of the Dalmatian corsairs, who issued from their haunts in the nearby Adriatic. Any one who has traveled along the seaboard railroad of southern Italy is familiar with the lonely little stations and the accompanying *marina,* or landing place, on the shore, while the unseen towns lie three to ten miles inland on acropolis sites in the mountains.[24] The same shifting of popula-

16 Strabo, Bk. V, Ch. III, 2, 5.
17 Strabo, Bk. VIII, Ch. VI, 14.
18 Strabo, Bk. X, Ch. IV, 7, 11.
19 Pausanias, Bk. III, Ch. XXIII, 1.
20 Thucydides, I, 103.
21 Strabo, Bk. VIII, Ch. VI, 22.
22 Thucydides, V, 82-83.
23 Norman Douglas: Old Calabria, pp. 135-140. Boston, 1915.
24 Baedeker: Southern Italy, pp. 221-222, 225-228. Leipzig, 1903.

tion has occurred on other seas where pirates have flourished. The German city of Lübeck was originally located nearer the sea than at present; but after it had been frequently demolished by the pirates who scoured the Baltic coast in the Middle Ages, it was rebuilt farther inland up the Trave River. Gradually, with the return of security, it built up its port of Travemünde at the mouth of the estuary.[25]

Thus geographic conditions made the Mediterranean basin a good hunting ground for the pirate. But they did more than this. They condemned certain districts of its coasts to be natural breeding places for corsairs and sent their inhabitants out upon the sea to earn an infamous livelihood. The fundamental geographic condition on these coasts is the same that makes for systematic robbery also in mountains and deserts, during their protracted centuries of backward economic development. The land yields only a scanty food supply, which must be eked out therefore by raids upon neighboring territories. The predatory expeditions of the mountaineers are directed against the agricultural plains at the foot of the highlands, as those of the ancient Alpine tribes against the lowland settlements of northern Italy. The son of the desert turns his raid against the river-valley farm lands, like those of the Libyan tribesmen against the neighboring Nile delta.[26] Where the unproductive area abuts upon the sea, like the Dalmatian or Caucasus coast, its people prey upon the nearest thoroughfares of maritime commerce, like the brigand on the mountain pass road, or pillage the nearest productive seaboard.

It is to be noted, moreover, that where mountain or desert tribes or steppe nomads make their way out to such coasts, they bring with them the mind of robbers and only alter their raiding method. They adapt themselves to the seaboard environment, blend with the local inhabitants, from whom they learn the art of navigation, and pursue their ancestral trade, exchanging the desert camel and steppe pony for the swift-moving ship. The mental habit of the previous habitat harmonizes with the economic conditions of the new one. This was true of the Illyrian pirates, whose highland brethren for centuries raided the frontiers of ancient Macedonia; it was true of the desert-bred Saracens wherever they touched the Mediterranean coasts, though their inland settlements were models of careful tillage and thriving industries; it was true of the ancient nomad Scythians[27] and later of the nomad Tatars when they settled on the Black Sea shore, and of the Zaporagian Cossacks of the Russian steppes, who in the seventeenth century put out from the Dnieper estuary in their frail skiffs to ravage the Turkish coasts.[28]

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[25] R. Reinhard: Die wichtigsten deutschen Seehandelstädte, p. 23. Stuttgart, 1901.

[26] For the general principles, see Friedrich Ratzel: Anthropogeographie, Vol. I, pp. 154 and 435, Stuttgart, 1899, and E. C. Semple: Influences of Geographic Environment, pp. 234-235, 490-496, 553-554, 586-591. New York, 1911.

[27] Strabo, Bk. VII, Ch. IV, 2, 6.

[28] For vivid description, see Gogol's novel "Taras Bulba," translated by Isabel Hapgood.

Like a natural product of the soil, pirates were a constant or recurrent phenomenon on the whole southern coast of Asia Minor, comprising ancient Lycia, Pamphylia, and Cilicia;[29] on the rugged littoral of Clazomenae peninsula of Asia Minor, where Mount Corycus rises abruptly from the sea;[30] in many Aegean islands and especially Crete; on the forbidding Caucasus coast of the Euxine where all geographical conditions were hostile to civilization;[31] on the Illyrian or Dalmatian coast of the Adriatic; on the Atlas-walled front of the African shore, the so-called Barbary coast; and in the Balearic Archipelago and Corsica.

All these districts, whether on islands, peninsulas, or continental shores, have in common certain geographic conditions which combined to force or lure the inhabitants into a piratical mode of life. So soon as war interrupted their few regular industries, or a corrupt government failed to hold them under restraint, or the maritime powers which policed the Mediterranean became weak or disorganized, these regions flashed into piracy. They were all mountainous coasts, broken up into isolated coves and valleys in which a strong centralized government was next to impossible, and endowed with little alluvial land. Natural conditions reduced tillage to a minimum and prevented the concentration of population necessary for local industries as a basis for commerce. The islands suffered always from the handicap of limited land, and therefore were more addicted to piracy, Thucydides tells us, than the continents. Samos, only 182 square miles in area, laid the financial and naval foundations of its great power under Polycrates (532-522 B. C.) by a long career of piracy. Its penteconters cruised the Aegean, plundering Greek and barbarian alike, levying blackmail for safe conduct. After the tyrant had made his fleet supreme on the sea, he organized the coasts and islands into a maritime confederation of wide extent; but the restless Samians easily reverted to their freebooting activities when opportunity arose.[32] Crete, though it was a large island and had a fertile maritime plain of some extent at the northern base of its long mountain range, gave evidence of a constant food problem. Like mountainous Arcadia and Aetolia, in order to reduce the pressure of population upon the limits of subsistence, it became a standing source for mercenary troops in the ancient Mediterranean,[33] when a strong hand kept order on the sea. When the hand was removed, Crete became a chronic source of pirates. On these, as on other islands, human life has resorted to crime in order to equalize population and food supply.[34]

On the rugged continental coasts of the Mediterranean, the mountains

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29 Strabo, Bk. IV, Ch. V, 1, 2, 3, 6.

30 Strabo, Bk. XIV, Ch. I, 35. Livius: Historia, XXXVII, 27.

31 Strabo, Bk. XI, Ch. II, 12, 15.

32 Herodotus, III, 39, 47, 57-59. Ernst Curtius: History of Greece, Vol. II, pp. 161-162, 170 and 212. New York, 1871.

33 Thucydides, VI, 25, 43; VII, 67. Polybius, II, 66; III, 75; V, 13, 14, 65, 79; XIII, 6; XXXI, 26; XXXIII, 16.

34 E. C. Semple: Influences of Geographic Environment, pp. 67 and 461-465. New York, 1911.

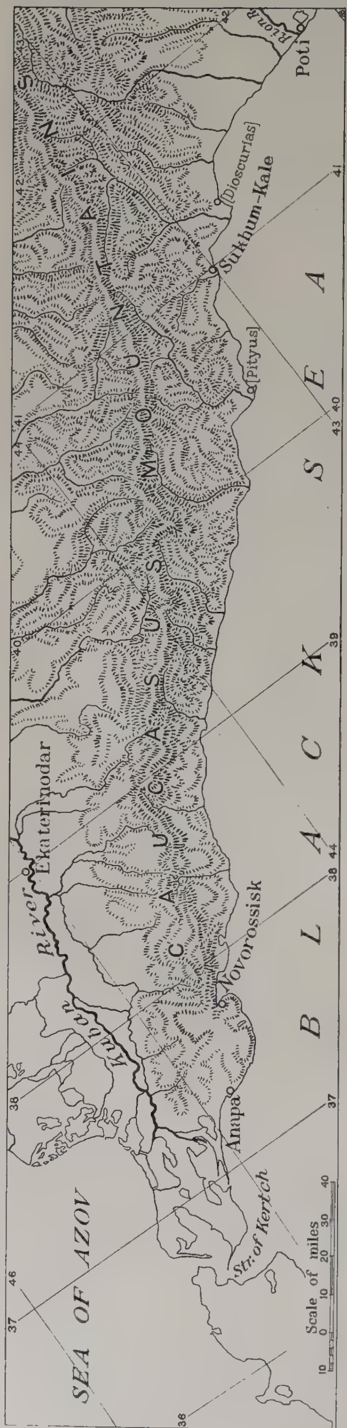

FIG. 1—The Caucasus coast of the Black Sea. Scale, 1:3,000,000. (Ancient names in hair-line type.)

provided timber for ships, but seriously impeded communication with the hinterland. Moreover, that hinterland was undeveloped on account of the mountain barrier, as in the case of the Illyrian interior; or unproductive on account of an arid climate, as in the case of the Cilician, Caucasus, and Atlas back-country. Hence it furnished no incentive for the commercial development of the littoral. This was the condition which for centuries made the Malabar coast of India and the Norwegian fiords nests of pirates. The Lebanon country had all the geographic conditions necessary for a pirate coast, with one exception. Trade here was more profitable than piracy, owing to the rich commerce from the Euphrates fords and the desert market of Damascus which forced its way through the mountain passes to the sea. But in Pompey's time, after two centuries of nerveless Seleucid rule in Syria, after the disorganization of the hinterland trade by the successive Armenian and Parthian conquest of northern Mesopotamia, and the diversion of the through Oriental commerce to the Red Sea and Nile route, robber chiefs held many coast cities of Phoenicia and made them pirate bases.[35] Joppa became a notorious haunt, and for this reason was destroyed by Vespasian in 68 A. D.[36]

The normal relation of coast to hinterland is a close interdependence. But in ancient times when the hinterland was impoverished and barred from the sea, and when the littoral itself afforded a slender basis of subsistence, the inhabitants of the seaboard were forced to live by a carrying trade under peaceful conditions, or by piracy, if the unorganized or dis-

[35] Mommsen: History of Rome, Vol. IV, pp. 423-424 and 430. New York, 1905.

[36] Strabo, Bk. XVI, Ch. II, 28. G. Adam Smith: Geography of the Holy Land, p. 138. New York, 1897.

organized state of society so permitted. The balance was easily disturbed and tipped from trade to freebooting at any jar to the social base.

Another common geographic condition was a multiplicity of small harbors and hidden recesses as lurking places for the robber fleets, with numerous headlands as outlook points and strongholds. In this respect the Aegean archipelagoes, the Balearic Isles, and the Illyrian coast were best equipped, because the maze of straits and inlets facilitated escape from pursuit. In this respect they resembled the Bahama Islands off the Florida coast,[37] which were long the hiding place of pirates operating about the Florida Straits and the Windward Passage. They offered the same geographic conditions as the network of sounds and creeks, deposit islands and barrier beaches, forming the embayed coast of North Carolina; there for over a century American pirates lay in wait for merchantmen trading along the coast between the West Indies and New England and did their best to nullify the effects of the obnoxious Navigation Acts.[38] Crete, like Cuba and Jamaica, had an admirable coastline for piratical purposes and nearby island-strewn seas in which its corsairs could safely operate. Lycia, Pamphylia, and Rugged Cilicia (Cilicia Trachea) had an abundance of small hidden ports and rock fortresses[39] but lacked the sheltering islands.

The Caucasus coast of the Euxine (Fig. 1) had nothing to recommend it for piratical purposes, except its poverty of resources and its ship-building timber. Its harbors were very few and badly exposed to the prevailing winds. It had no islands and for long stretches not even a beach. The Caucasus buccaneers, when they returned in autumn from their marauding expeditions, lifted their slender *camarae*, or boats, on their shoulders and hid them in the mountain forest until spring again opened their business season.[40]

All these pirate coasts lay on established trade routes. The robber fleets of the Caucasus swooped down upon the well-laden Greek ships making their usual coastwise voyage to the ports of the Crimean Bosporus, there to exchange wines and cloth for grain and cattle. In the third Mithradatic War, the Pontic corsairs who joined the fleet of the Asiatic king were doubtless recruited in part from this mountainous coast; for thither retreated the last remnants of the pirate bands who, for two years, withstood a Roman siege in Amisus, Sinope, and Heraclea on the seaboard of Asia Minor.[41] During the time of Emperor Tiberius, we find the pirates from this east coast of the Euxine preying upon commerce and pillaging towns and villages of the surrounding lands. They were later reinforced by Scythian corsairs from the Dniester estuary, and in the third century these

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37 David Hanney: The Sea Trader, p. 234. Boston, 1912.

38 S. C. Hughson: Carolina Pirates and Colonial Commerce, 1670-1740. Baltimore, 1894.

39 Strabo, Bk. IV, Ch. V, 1, 2, 3.

40 Strabo, Bk. XI, Ch. II, 12.

41 Mommsen: History of Rome, Vol. IV, pp. 333-335. New York, 1905.

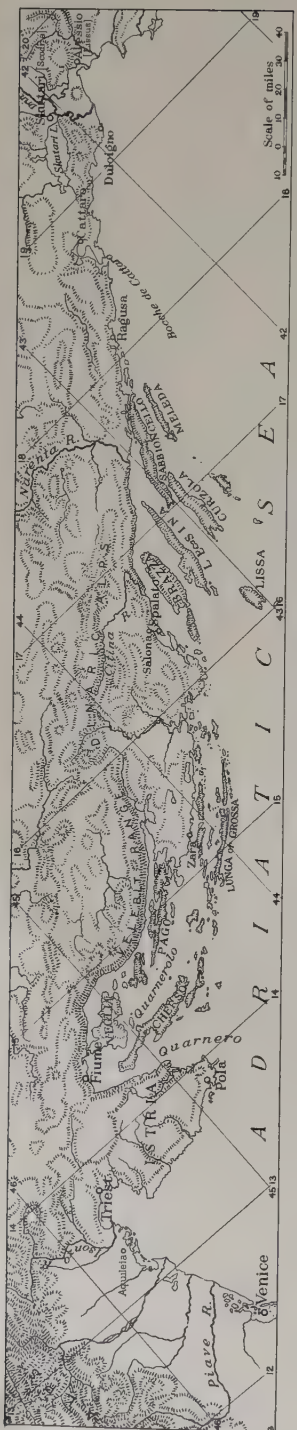

Fig. 2—The Dalmatian coast of the Adriatic. Scale, 1:4,000,000. (Ancient names in hair-line type.)

"Scythicarum gentium catervae" ravaged the shores of the Propontis and Aegean.[42] The Romans had two lonely stations, Dioscurias and Pityus, on the best harbors this Caucasus littoral could offer; and their remote outpost situation strongly suggests that they were designed to police this lawless coast.

In the Middle Ages the Caucasus pirates were still plying their ancestral trade, though their stock had probably received an infusion of fresh Tatar blood. This time they were looting the richly freighted caravels bound for the Genoese colonies in the Crimea. And again, in the eighteenth and early nineteenth centuries, they issued forth in their poor barks and seized any Turkish or Russian vessels which approached their shores.[43] Hence, Genoa, at some remote date, established a fort at Anapa on this coast for the protection of her commerce. Centuries later, on the ruins of this Genoese stronghold, the Turks built a fort in 1783, and transferred it to the Russians in 1828.[44]

The Aegean pirates, when anarchy reigned on the seas, waylaid ships at the various crossroads of that much-traveled basin in ancient and mediaeval times. The pirate-haunted coast of southern Asia Minor flanked the great Oriental trade track which skirted along this shore and ran thence westward past Rhodes, Crete, and Cythera. These islands afforded choice bases for depredations upon the eastern commerce and also upon the traffic passing in and out of the Aegean. Rhodes, however, seems always to have had both a firm, enlightened government and a strong fleet. Hence, she repeatedly fought the pirates on her own account and supported

[42] Mommsen: Provinces of the Roman Empire, Vol. I, pp. 262-263. New York, 1887.

[43] Chevalier Marigny: Three Voyages in the Black Sea to the Coast of Circassia, pp. 9-10. London, 1837. Translated from from the French.

[44] *Blackwoods Magazine*, Vol. 42, 1837, p. 642.

Rome in its efforts to suppress the evil. Cythera was long a depot of Phoenician pirates. Crete, though its Minoan kings enjoyed the distinction of being the first to put down piracy in the Aegean, became a nest of freebooters so soon as the decline of Greek naval power brought disorder upon the sea.[45] Finally, the extent and flagrancy of their depredations, in co-operation with the Cilician pirates, forced Rome, in 67 B. C., to conquer and annex the island as a police measure. Crete in Saracen hands, from 823 to 960 A. D., again became a formidable nest of corsairs and a great slave market.[46] But the location which made it a desirable pirate base also made it for over four centuries, from 1206 to 1669, the most important commercial base of Venice in eastern waters.

Pompey's famous campaign of 64 B. C. was directed against the pirates who, for nearly forty years (102 to 64 B. C.), had terrorized the Mediterranean, organizing themselves into an international sea power for robbery which embraced the whole basin. They so effectually stopped traffic that dreadful scarcity of provisions prevailed in Italy and especially in Rome, which had come to rely on her oversea grain supply. The buccaneers had their ports of refuge on all the chronic pirate coasts of the Mediterranean from Mauretania to Cilicia, but the latter was their acropolis.[47] Nature had equipped it with every physical facility for the trade—timber, harbors, signal stations, coast fortresses, impregnable mountain retreats.[48] Moreover, its location, remote and inaccessible from the weak Seleucid capital, had placed it beyond reach of the arm of authority and left its people free to follow their marauding bent. Hence the Cilician sea chiefs were the last to hold out against Pompey, and his strong repressive measures against piracy produced here only temporary results. The corsairs of Cilicia resumed activities in the early years of Augustus. One of their tribes, the Clitae, necessitated a Roman punitive expedition in 36 A. D. and again in 52 A. D. In the third century the Cilician pirates emerged as the Isaurians, who from the Cilician mountains plundered on land and sea.[49]

The Adriatic furnished a convenient thoroughfare for piratical operations. Throughout ancient and mediaeval times the rich commerce which traversed this broad marine channel, to and from the ports about the Po mouth, had to run the gauntlet of Illyrian or Dalmatian pirates, whose haunts flanked the sea for four hundred miles (Fig. 2). These freebooters also pillaged vessels sailing across the basin from Italy and ravaged the western coasts of Greece from Epirus to Messina. When their sovereign, Queen Teuta of Scodra, or Scutari, provoked the Romans to punitive operations in 230 B. C., the Illyrian pirates could send out a fleet of a hundred vessels equipped with a force of five thousand men. This first effort of the

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45 Polybius, XIII, 8. Mommsen: History of Rome, Vol. III, pp. 291-292. New York, 1905.

46 Gibbon: Decline and Fall of the Roman Empire, Vol. VI, pp. 37-38, 46, and 57. New York, 1907.

47 Mommsen: History of Rome, Vol. III, p. 292; Vol. IV, pp. 307-312, 351-355, and 301-302.

48 Strabo, Bk. IV, Ch. V, 1-6.

49 Mommsen: Provinces of the Roman Empire, Vol. I, pp. 363-365. New York, 1887.

Romans to police the Adriatic resulted in the escape of Queen Teuta to Rhizon (Resine) in the marine labyrinth of the Gulf of Cattaro,[50] now the impregnable naval base of modern Austria in these waters; but the treaty of peace excluded Illyrian raids from the southern part of the basin beyond Lissus (Alessio). Fifty years later the founding of Aquileia at the northern end of the Adriatic helped to suppress piracy on those shores.[51] The significant result of Illyrian piracy in these waters was the first interference of Rome in affairs of the Balkan Peninsula, the establishment of Roman naval supremacy in the Adriatic, and the acquisition of certain islands and ports on its eastern shore[52] which were valuable bases for the later extension of Roman power in Greece and Macedonia.

The Illyrian pirates still persisted in their depredations. The robber confederacy which had its capital at Scodra, like its brothers elsewhere in the Mediterranean, was open to engagements as a mercenary fleet. In this capacity it took part in the third Macedonian war against the Romans, and after the battle of Pydna, in 168 B. C., saw its fleet captured and its operations checked for a time. Soon its neighbors, the Dalmatian tribe of pirates, who held the littoral from the Narenta River northward beyond the Cetina, committed such widespread depredations that the Romans sent punitive expeditions against them in 156 B. C., again in 155 B. C. and again in 135 B. C.[53] This last drove the pirate population inland and made them settle in barren mountain valleys where they starved and pined away. But their old haunts on the sea were soon reoccupied by remnants of the tribe, probably reinforced by refugees and outlaws, because the Romans had to punish the Dalmatians again in 119 B. C.[54] In seventy years they so recouped their fortunes and extended their confederacy that, as allies of Pompey, they offered long-continued resistance to the fleets of Caesar sent against them.[55] After order was restored, Imperial Rome established on this coast, at Pola and Salona, her most important Adriatic naval stations, because the opposite Italian coast had no adequate harbors, and she drew from these former outlaw shores the marines to man the imperial navy, just as Austria does today.

The decline of Roman power during the *Völkerwanderung* was followed by insecurity of traffic on all Mediterranean routes. In the Adriatic especially, the growing Venetian commerce of the eighth and ninth centuries and the richly freighted vessels which traveled this long waterway furnished tempting booty for piratical attacks. Geographic conditions were unaltered on the mountainous and island-strewn coast of Dalmatia, but the original Illyrian population had been largely diluted, and at many points even

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[50] Polybius, II, 5, 6, 8-12.

[51] Mommsen: History of Rome, Vol. II, p. 372. New York, 1905.

[52] *Ibid.*, Vol. II, pp. 218-9.

[53] *Ibid.*, Vol. II, pp. 437, 505, and 508-509; Vol. III, pp. 421-422 and 426-427.

[54] Strabo, Bk. VII, Ch. V, 4-6, 10.

[55] Mommsen: History of Rome, Vol. V, pp. 103-104, 235-236, 284-285. New York, 1905.

replaced, by the influx of Slavic Serbs and Croatians who poured down to this coast in the seventh century.[56] These interlopers, accustomed to the inland occupations of farming and cattle-herding, abandoned their ancestral callings and adapted themselves to their new environment. They learned from the surviving Illyrians the traditional trade of the coast, became the only expert navigators that the Slav race has ever turned out, and developed buccaneering aptitudes that would have elicited the admiration of old Queen Teuta. Therefore, when the Venetian galleys proved worthy prizes, this new race of freebooters issued from the old pirate haunts at the mouth of the Narenta and along the whole Dalmatian coast. The task of policing the Adriatic against the marauders began in 827 and continued without interruption till the end of the eighteenth century; because the richer grew Venetian trade, the greater was the temptation which it offered to the corsairs.[57]

At first the Venetian fleets were too weak to make effective resistance. They seized pirate ships, to be sure, and carried the Slav captives in such numbers to Venice to be sold as slaves that the race name became the common term for human chattels in western Mediterranean lands; but only a large navy and systematic campaigns against the pirates could remedy the evil. The increased armament necessary for coping with the marauders undoubtedly contributed greatly to the development of Venetian sea power both within and without the Adriatic.[58] Moreover, the necessity of protecting Istria from depredations led finally to Venetian supremacy in that peninsula, while the yet stronger necessity of cleaning out the corsair nests on the whole Dalmatian coastland led to the conquest and annexation of the littoral in 998. This move was imperative, because the pirates had adopted the method of the ancient Illyrians and hired themselves out as a mercenary fleet to the enemies of Venice, who thus found a convenient base in the Adriatic.[59]

But the conquest of Dalmatia did not bring immunity to the Republic. The neck of the Adriatic bottle continued to send forth a stream of wealth that attracted sea-robbers from all parts of the Mediterranean. From 860 to 912, year after year, Saracen corsairs were hanging about the narrow Strait of Otranto.[60] A famous Genoese corsair seized Corfu for a short period as a convenient base, till it was wrested from him by Venice in 1206.[61] After this, in the late thirteenth and during the entire fourteenth century the possession of all the Ionian Islands, which occupied a strategic position near the Otranto gate, was disputed by Venetians and by Greek and Italian corsairs. From this base they ventured into the lower Adriatic

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[56] W. Z. Ripley: Races of Europe, pp. 404, 410-414. New York, 1889.
E. W. Freeman: Historical Geography of Europe, p. 118. London, 1882.

[57] W. C. Hazlitt: The Venetian Republic, Vol. I, p. 60. London, 1900.

[58] W. R. Thayer: Short History of Venice, pp. 30-35. New York, 1905.

[59] W. C. Hazlitt: The Venetian Republic, Vol. I, pp. 78 and 106-109. London, 1900.

[60] *Ibid.*, Vol. I, p. 62.

[61] Article "Ionian Islands," Encycl. Britann., 11th edit., Vol. 14, 1910.

for their prey. The Republic maintained her command of the Adriatic only by means of a powerful patrol fleet, which policed the sea for pirates and vessels carrying contraband goods.[62]

The decay of Venice, due to the Turkish conquest of Constantinople and the discovery of the sea route to India, was attended by a decline of her naval power which, from the sixteenth century on, enabled the Dalmatian coast population to resume their piracy. The Adriatic was also scourged by the Tunisian and Algerine corsairs, by Tuscan pirate ships fitted out with Corsican captain and crew, by Maltese Knights of St. John and Florentine Knights of St. Stephen who turned sea-robbers, and even by subjects of the Papal States.[63] With the Barbary and Dalmatian pirates, Venice alternated between conflicts and treaties on a blackmail basis up to the last years of her existence as an independent state.

The appearance of Genoese and Tuscan corsairs during the Middle Ages in Adriatic waters looks like a recrudescence of the ancient piracy which emanated from the Etruscan and Ligurian coasts. Ancient Etruria lacked the essential geographic conditions for chronic piracy, owing to its fertile soil and varied relief; but its location conferred upon it control of the narrow channel of traffic between the islands of Elba and Corsica, and gave it ready access to the rich commerce passing through the Strait of Messina.[64] Undoubtedly this advantageous location, plus the desire to exclude Greek competition from the Tyrrhenian trade, contributed to the persistence of Etruscan piracy. In 482 B. C. we find Anaxilaus, tyrant of Rhegium and Zancle, fortifying the Scyllaeum promontory to prevent the Etruscan sea-robbers from passing through the Strait of Messina; and thirty years later Hiero of Syracuse, who had established his naval power in the Tyrrhenian Sea, sending forth an expedition to ravage the coast of Corsica and Etruria, and to occupy the island of Elba, in order effectually to suppress piracy.[65] The evil recurred sporadically, however, for over a century after this.

Corsica, by reason of its rugged relief, poor soil, indented coastline, and location on marine trade routes, had all the physical qualifications for chronic piracy. To these were added yet another. Its small geographical area, limited population, and political dismemberment, due to its physical dismemberment, all combined to weaken the island and make it a ready prey to every policy of expansion which emanated from the near mainland, whether from ancient Etruria, from Carthaginian, Vandal, or Saracen Africa, from Rome, Pisa, Genoa, or France. To all except the African states, the location of Corsica made it a constant menace if held by a hostile power. Hence, its football political experiences were the persistent result. The free spirit of the mountain islanders made them irreconcilable sub-

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[62] P. Molmenti: Venice in the Middle Ages, Vol. I, pp. 117, 121-123, and 130. Chicago, 1906.

[63] David Hanney: The Sea Trader, p. 253. Boston, 1912.
W. C. Hazlitt: The Venetian Republic, Vol. II, pp. 205-206, 261-263, and 309-312. London, 1900.

[64] Strabo, Bk. VI, Ch. I, 5.

[65] Mommsen: History of Rome, Vol. I, pp. 415-418. New York, 1905.

jects under foreign rulers. Hence their constant rebellions through five centuries of Genoese rule, their chronic brigandage and feuds, all together yielded a crop of outlaws who found a ready outlet for their energy in piracy, while hatred for the mainland states gave them motive enough for depredations.[66]

The rugged coast of the Maritime Alps and Ligurian Apennines, with no harbors and few anchorages and only a slender strip of tillable soil here and there, occupied an advantageous position on the ancient line of coastwise traffic between Italy and the Rhône Valley. From the earliest times the Ligurians who held this mountainous littoral systematically pillaged by land and sea.[67] The little Stoechades Islands (Isles d'Hyères), which were cultivated by the Greek citizens of Massilia, were provided with garrisons to ward off piratical attacks, in the days before Imperial Rome brought order in these waters.[68] The Massiliot coast settlements to the west suffered as did the Pisans to the east. And only a century or more of constant conflict reduced the marauders to subjection.[69] By the second century B. C. their raids became intolerable, because they were in a position to threaten Rome's increasing coastwise trade with Massilia, the new *Provincia Romana,* and Spain, which was acquired in 201 B. C.

The Spanish commerce suffered also from buccaneers who had their base in the numerous lurking places of the Balearic Archipelago. These islands had been occupied by the Carthaginians at an early date[70] as advanced outposts against the Massiliots, and long served as stations for piratical descents upon Massiliot merchantmen;[71] for this mode of warfare was more congenial than big conflicts to all representatives of the Phoenician race. After the Punic Wars, these islands continued to be haunts of sea-robbers, until in 123 B. C. the Romans were forced to seize them in order to secure Spanish trade from further molestation.[72]

These islands possessed for the most part a fertile soil and ample fisheries, which together yielded an adequate but by no means sumptuous food supply and inclined the inhabitants to peaceful pursuits.[73] But the frequent appearance of Balearic slingers among the Carthaginian mercenaries during the Punic Wars[74] points to a pressure of population upon the means of subsistence in the home islands which might readily tip the scales in favor of piracy. Furthermore, the abundant coves and hiding-places along their coasts suited to small craft and a location within striking distance of two important trade routes of the western Mediterranean disposed the inhabit-

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66 David Hanney: The Sea Trader, p. 253. Boston, 1912.
67 Strabo, Bk. IV, Ch. VI, 2-4.
68 Strabo, Bk. IV, Ch. I, 10.
69 Mommsen: History of Rome, Vol. II, p. 375; Vol. III, p. 382, note. New York, 1905.
70 Diodorus Siculus, Bk. V, Ch. 16.
71 Mommsen: History of Rome, Vol. II, p. 143. New York, 1905.
72 *Ibid.*, Vol. III, pp. 233 and 291.
73 Diodorus Siculus, Bk. V, Ch. 17. Strabo, Bk. III, Ch. V, 1, 2.
74 Polybius, I, 67; III, 33, 72, 83, 113; XV, 11.

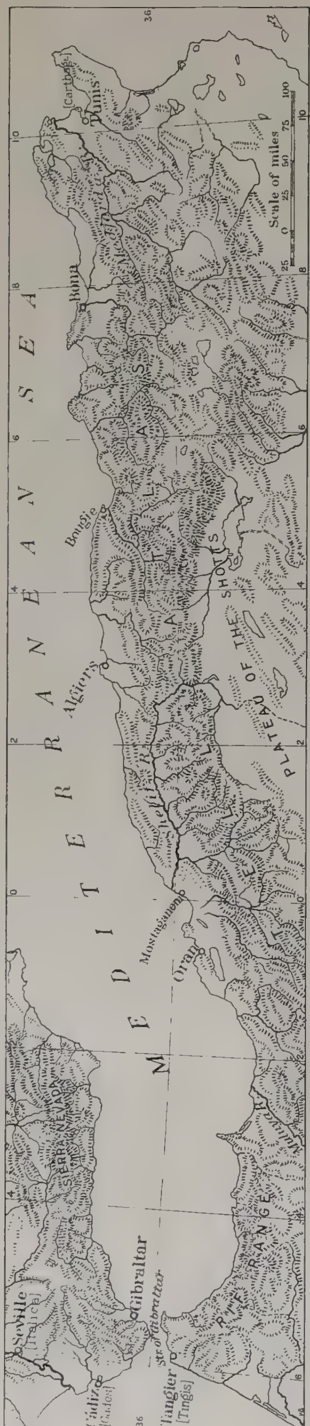

FIG. 3—The Barbary coast. Scale, 1:4,500,000. (Ancient names in hair-line type.)

ants to freebooting activities so soon as orderly control of the seas was relaxed; and they likewise attracted both individuals and nations to whom lawless pursuits were congenial. There is a recognized law of such geographic polarity.[75] Thus, the Balearic Isles were seized by the Saracens in 798 and became the haunt of pirates who were attracted thither from all the surrounding coasts. In 1009 they were erected into a separate corsair kingdom, which for over two centuries preyed upon the growing trade of Catalonia near by, especially the port of Barcelona. The Catalans and Pisans participated in a Crusade against the islands, instituted by Pope Paschal II; but not until James I, King of Aragon and Count of Barcelona, conquered and annexed them between 1229 and 1235, were Catalan merchantmen safe on the sea.[76] With the restoration of order, the archipelago became the center of a thriving maritime commerce which justified the wisdom of the ancient Rhodians[77] and Phoenicians[78] in placing trading colonies on these islands.

The rugged mountainous front which Africa presents to the western Mediterranean possesses all the qualifications for a typical pirate coast (Fig. 3), except in the Tunisian peninsula, where alluvial plains and broad intermontane valleys give access to a large and fertile hinterland. Here ancient Carthage found the land base for her great territorial and maritime empire. At several points along the Atlas coast small alluvial plains, like that at modern Oran, Mostaganem, Algiers, and Bona, break the continuity of the mountain rampart bordering the sea and afford a local food supply,

[75] E. C. Semple: Influences of Geographic Environment, p. 160. New York, 1911.

[76] Ulick R. Burke: History of Spain, Vol. I, p. 258. London, 1900.

[77] Strabo, Bk. XIV, Ch. II, 10.

[78] John Kenrick: Phoenicia, pp. 116-118. London, 1855.

but they are barred from hinterland trade. In front of them, on the other hand, from time immemorial have passed fleets of merchantmen, laden with the products of the East, to be exchanged in the markets of Spain; for along this coast ran the great sea thoroughfare of ancient times, leading to the Pillars of Hercules. Hence this littoral in all ages has sent out piratical raiders against the commerce of the western basin and the opposite shores of Europe.[79] Prior to Pompey's great campaign it furnished retreats and markets for the buccaneers who terrorized Italy and Sicily. The Rif coast, whose rugged mountains wall the African front of the Iberian Sea for two hundred miles east of the Strait of Gibraltar, was an incorrigible pirate haunt. Its native Mauri or Berber sea-rovers found a profitable field of operations in the nearby strait and the rich Spanish province of Baetica in the Guadalquivir valley, with its island port of Gades (Cadiz). In the second century of the Empire they repeatedly raided up the river as far as Italica (Seville), in spite of the Imperial troops stationed there to overawe the pirates. Tingis (Tangier) also had a garrison whose main duty was to hold the Rif corsairs in check; but their inroads across the strait into the rich districts of southern Spain continued through the whole imperial period. In Nero's time they caused the Baetica shore to be described as *trucibus obnoxia Mauris*. They were troublesome in the reign of Marcus Aurelius, again under Septimus Severus, and again under Alexander.[80]

The geographical location of the Tunisian peninsula offered facilities for the conduct of wide-reaching maritime trade, when Carthaginians, Sicilian Greeks, and later the Romans maintained order on the sea; or for equally wide piratical depredations, when the decline of Imperial Rome gave free rein to the Vandal kingdom of North Africa. This ill-organized, barbarian community, bent upon spoils more than conquest or power, utilized the nautical aptitude of the local inhabitants and the commanding position of Carthage to pillage all the neighboring coasts from Spain to Venetia and western Greece.[81] Its maritime supremacy was maintained for thirty years during the life of King Genseric, but, gradually declining, was crushed in 533 with the downfall of the Vandal dominion.

The Mohammedan conquest of North Africa in the seventh century brought a new lease of life to piracy on this coast and intensified it by racial and religious wars which prolonged it through a thousand years. The disintegration of the Saracen dominion in Africa into several small states during the fourteenth century and the arrival here of the Moorish exiles from Spain in 1502 lent new motives, both of self-protection and vengeance, to the pirate communities of the African coast. Bougie, Algiers, and Sallee, outside the Strait, became notorious haunts of the "sea-skimmers." Spain, in an effort to police the pirate coast, seized Tunis, Oran, and an island fort

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79 Article "Barbary Pirates," Encycl. Britann., 11th edit., Vol. 3, 1910.

80 Mommsen: Provinces of the Roman Empire, Vol. I, pp. 73-74; Vol. II, pp. 353. New York, 1887.

81 Gibbons: Decline and Fall of the Roman Empire, Vol. IV, pp. 1 and 27. Edit. by J. B. Bury, London, 1901.

in the Bay of Algiers, but was soon forced to relinquish them, because new vigor was infused into this whole pirate coast by Turkish corsair captains from the Aegean. They seized Tunis, Algiers, and Tripoli and formed them into military republics living by plunder under a nominal Turkish suzerainty. Here piracy reached its zenith in the seventeenth century but maintained itself till the French conquest of Algiers in 1830, though the Rif pirates continued their raids for several decades. The striking feature of Barbary piracy is its survival long after Mohammedan corsairs had elsewhere abandoned their trade.[82] This was made possible by the rivalry of England, France, and Turkey in the Mediterranean, the maritime weakness of Spain and Italy, the peculiar geographical fitness of the Barbary coast for piracy, and the elements of its population, constantly recruited from robber tribes of the desert and of the Atlas Mountains.

Piracy was a social-economic effect of geographic conditions in the Mediterranean basin, but it produced in turn certain political effects that played no small part in Mediterranean history. Instances have already been given where pirate fleets were employed as a mercenary navy. In all probability those were fleets maintained and trained by piracy which Xerxes drafted into his forces for the Grecian campaign from the shores of Cilicia, Pamphylia, and Lycia.[83] Organized Persian rule offered them a legitimate occupation for their energies. Several centuries later King Tryphon (146-139 B. C.), a usurper on the throne of Syria, encouraged the corsairs of Cilicia and used their help to maintain his position.[84] Spartacus in 72 B. C. relied on the aid of pirates in the Servile War.[85] The buccaneer allies of Sertorius in the Spanish uprising were a match for the Roman fleet, and from their stronghold at Diana on the Artemisian promontory they intercepted Roman supply ships on their way to the army in Spain.[86] Cilician pirates under the leadership of Sertorius attacked the Pityussae Islands off the Spanish coast.[87] In the long-sustained Mithradatic Wars, all the pirate fleets of the eastern Mediterranean were employed by the Asiastic king to reinforce his Pontic and Aegean navies. By their aid he established his supremacy on the sea, almost paralyzed the Roman offensive for several years in the first war and protracted the final conflict in the second.[88] The presence of large bodies of corsairs for hire introduced, therefore, an incalculable factor into many Mediterranean wars.

Constant piratical attacks had an important politico-economic effect upon the states assailed. These found it necessary to build up a standing navy to convoy their merchantmen, protect the home coasts, and destroy

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[82] Article "Barbary Pirates," Encycl. Britann., 11th edit., Vol. 3, 1910. Hans Helmolt: History of the World, Vol. IV, pp. 251-254. New York, 1904.

[83] Herodotus, VII, 91-92.

[84] Mommsen: History of Rome, Vol. III, p. 292. New York, 1905.

[85] *Ibid.*, Vol. IV, p. 362.

[86] *Ibid.*, Vol. IV., pp. 282 and 286.

[87] Plutarch: Sertorius, Ch. VII.

[88] Mommsen: History of Rome, Vol. IV, pp. 28, 33-43, 323-324, 333-334 and 351-353. New York, 1905.

the marauding fleets. The increased maritime efficiency and daring which they thus attained reacted favorably upon their merchant marine. In all probability the sea power of Minoan Crete at the time it established its thalassocracy had been developed in part by wars against early Aegean corsairs. Negligent Rome in the last half century of the Republic was driven again and again to refit or supplement or rebuild its rotting fleet to cope with the Mediterranean pirates. Venice, as has been shown, was forced to adopt a big naval program by freebooting neighbors on the Dalmatian coast. Genoa, Pisa, Amalfi, and Barcelona, in their protracted naval wars with the Saracen pirates of the western Mediterranean, built up a sea power which inaugurated or greatly stimulated their successful careers as maritime states.[89]

Constant piratical attacks led not only to reprisals but also to conquest of the lawless coasts in order to police them. The captured ships and seamen went to swell the naval and merchant marine of the victorious nation, thus contributing to its sea power. The newly acquired coasts often proved so valuable as bases for extended maritime trade and military operations, that they whetted the national thirst for farther territorial expansion. Instances of this process have already been given, notably in the case of ancient Rome and mediaeval Venice in their campaigns against the Dalmatian pirates. Spain in the early sixteenth century was drawn by the Barbary pirates into a war which might have resulted in the conquest of the African coastlands, had not Spain's attention been diverted at the time by the wealth of the Americas. James I of Aragon, at the instigation of his commercial subjects of Barcelona, conquered and annexed the piratical Balearic Isles. It was the revival of Barbary corsair activities after the Napoleonic Wars that in 1827 drew the unemployed energies of France to the occupation of Algiers and inaugurated her important North African policy.

The French conquest of the strongest robber state dealt a serious blow to the Barbary pirates. Shortly before they had been chastised by American, English, and Dutch warships. But what whipped them was steam navigation. Their rugged coasts could not breed mechanics and engineers.

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89 Bella Duffy: The Tuscan Republics, pp. 1, 2, 115-117, 23-26 and 34-35. New York, 1893. Articles "Genoa" and "Pisa," Encycl. Britann., 11th edit., Vols. 11 and 21, 1910 and 1911.

GEOGRAPHICAL RECORD

NORTH AMERICA

Success of Canadian Experiments in Yak-Breeding. In 1909 the Duke of Bedford presented six yaks to the Dominion Government with the object of encouraging experimentation in the breeding of a type of animal suited to the more difficult northern portions of Canada and to the western mountain country. They were placed on the experimental farm at Brandon, Manitoba, and remained there until 1912, when they were transferred to a new environment among the mountains at Banff, Alberta. With the exception of the loss of one cow and its calf in 1913 no losses have occurred since the transfer of these animals. These encouraging results in an important experiment in zoögeography promise further development of the plan on broader lines. Through the courtesy of the Dominion Parks Branch, now in charge of the yaks, we are able to include the latest statistics relating to the herd, as follows:

TABLE OF INCREASE OF YAKS SINCE THEIR ARRIVAL AT BANFF

	MALE	FEMALE	CALVES	TOTAL
July, 1912	2	4	0	6
April, 1913	2	4	1	7
May, 1913 (Loss: 1 cow and 3-days-old heifer)	2	3	0	5
July, 1913 (Increase: 1 male and 1 female)	2	3	2	7
April, 1914	3	4	0	7
May, 1914 (Increase: 1 male)	3	4	1	8
June, 1914 (Increase: 1 male)	3	4	2	9
July, 1914 (Increase: 1 female)	3	4	3	10
June, 1915 (Increase: 1 male and 1 female)	5	5	2	12
July, 1915 (Increase: 1 female)	5	5	3	13
September, 1915 (Increase: 1 female)	5	5	4	14
April, 1916	6	8	0	14

Proposed New Map of Yukon Territory. Mr. J. H. Brownlee, the Director of Surveys of Yukon Territory, Dawson, has been instructed by the council, or local governing board, to prepare the necessary data for a new map of the territory. The scale of the new map will be the same as that of the recent base map of Alaska in 1:1,500,000 published by the U. S. Geological Survey. All previous work will be made use of in the compilation, particularly the surveys by the Canadian Geological Survey and the Topographical Surveys Branch of the Department of the Interior, and the recently published survey of the 141st meridian (Alaska-Yukon boundary).

Aërial Transportation in the United States. The value of the aëroplane in military transportation has obscured its utility for civil affairs. That the latter is not entirely neglected is proved by the fact that the U. S. Post Office has invited proposals for the carrying of mail by aëroplane along certain trial routes. Of the eight routes specified one is in Massachusetts; the other seven are in Alaska. The Massachusetts service, between Nantucket and New Bedford, performed by water in five to six hours, should only take fifty minutes by air. More remarkable time saving would be accomplished in the case of the Alaskan routes. The itinerary altogether covers 1846 miles and runs from Prince William Sound to the interior and to the west coast and back, and includes as terminal points Valdez, Fairbanks, Tanana, Kaltag, Nome, Iditarod, Seward, and Anchorage (*Flying*, Vol. 5, No. 2, New York, 1916).

Forest Fire-Weather Warnings in the West. A forest ''fire-weather'' warning service was inaugurated in the summer of 1913 in the Portland, Ore., and in the San Francisco forecast districts. In 1914 the service was extended to all other forecast districts. The ''reasonable success'' of these warnings during the period 1913-1915 has resulted in the definite establishment of a fire-warning service as a recognized branch

of Weather Bureau activity. *Instructions No. 26* (April 10, 1916) are as follows: "District forecasters are authorized to issue warnings, to be known as 'fire-weather warnings,' of conditions favorable for the inception of fires in the forested regions of their respective districts." That this new service has already proved of value to the Pacific Slope forest interests is evidenced by the adoption, by the Forestry Industry Conference, at San Francisco, October 19–20, 1915, of a resolution appealing to Congress for an annual appropriation of $10,000 to be applied in strengthening and improving the service. The preamble to the resolution reads as follows: "The usefulness of the U. S. Weather Bureau in forecasting dangerous fire weather is no longer open to question." Mr. E. A. Beals, District Forecaster at Portland, Ore., points out (*Monthly Weather Rev.*, Vol. 44, 1916, pp. 135-138) that forest fires cause an annual loss of about seventy human lives, the destruction of trees worth at least $25,000,000, and the loss of crops, buildings, and live-stock worth many millions more. Warnings of the probable occurrence of winds of sufficient velocity to be dangerous make it possible to increase the fire crews, to stop burning permits, and to take other precautionary measures.

R. DeC. Ward.

EUROPE

Sunshine in the British Isles. A paper by Mr. F. J. Brodie on "The Incidence of Bright Sunshine over the United Kingdom during the Thirty Years 1881–1910" appears in the *Quarterly Journal of the Royal Meteorological Society* for January, 1916. At the close of the decade ending with 1910, the total number of stations reporting sunshine to the Meteorological Office and to the Royal Meteorological Society had reached 198. In discussing the average distribution, the data from 66 stations were utilized, the maps constructed showing the seasonal and annual incidence. The broad features of the distribution show an increase from north to south, with a tendency to coastal maxima and inland minima. There is ample confirmation, even ignoring the records of the large manufacturing towns, for an area of small sunshine over the central parts of northern England. A special examination of the records in London and other manufacturing centers shows a marked deficiency resulting from smoke, more particularly in the winter months. There is evidence, however, that the abatement of the smoke evil has somewhat remedied these conditions in recent years. R. DeC. Ward.

Sledge Traffic Between Norway and Finland. The February number of the *Review,* discussing Russia's war-time outlets to the sea (pp. 128-132), mentioned sledge traffic between Kandalaksha and Rovaniemi (map on p. 130) as an adjunct to rail transportation. The extent to which Russia is exerting herself to improve her inadequate means of communication in the hour of her trial is manifested once again by the news of the establishment of a winter sledge route between Kirkenes, on Varanger Fiord in northernmost Norway, and Finland. According to a report from the Italian legation in Christiania (*Rapp. dei Agenti diplomatici e consolari,* March, 1916, No. 5, p. 4), the journey between the Norwegian seaport and Kyrö in Finland requires four days. The return trip, however, is made in three days. From Kyrö the road extends as far as Rovaniemi, where rail connection is made. The condition of the road for the entire length favors the journey. A minor traffic is carried on from Bugö, also in Varanger Fiord. Here reindeer are used as draught animals, whereas over the Kirkenes line horses are employed exclusively.

Between 3,500 and 4,000 tons of merchandise are now shipped during the winter season. Each sledge carries between 1,500 and 2,000 pounds. Efforts are made to increase the number of sledges to one hundred and fifty per day. The freight has in the past months consisted largely of cotton for Finnish factories. The line has proved of great value to the industry of Finland in general.

An Old-Established Fair in Modern France. Above Grenoble the left bank of the Grésivaudan Valley is occupied by alluvial fans whose apexes have long been so many crystallization points of population. In the old days it was the agriculture of the lower slopes of the fans that held the population. Now it is industrialism. There is one exception. This is the village of Goncelin, less overshadowed by the mountains and less blessed with resources of "white coal," but more favored agriculturally. Yet agriculture is not Goncelin's distinction. Because it is a center of local roads, situated at a river ford and at the point where one of the main roads for Savoy leaves the valley, Goncelin has always enjoyed a commercial prominence. Its commercial activity, well established at the commencement of the eighteenth century, is concentrated into a system of fairs.

Fairs are held every Saturday of May and June and again in November and December, and a summer fair is held in August. The fairs are in harmony with the

pastoral rhythm of the region. The cattle go up to the mountains for the summer and return to the valley for the winter. The valley farmers, however, seldom move with their flocks but loan them to the hill men. The loan is usually based on a payment in kind, butter and cheese for the milk animals, in silver for the others. It is reckoned that of the three months of estivation the first pays the loan, the second, pasturage and the hire of herdsmen, and the third brings in clear profit. In summer the fabrication of butter and cheese is particularly active, and the summer fair is the "Fair of Cheeses." A special feature of the Goncelin fair is the importation of pigs to supply the local demand. Every peasant of the valley fattens a pig during the summer and kills it in the fall, but he does no breeding. The animal is replaced at the following spring fair. Goncelin's sphere of economic influence is in the main limited to its own region. Cattle represent a commodity most advantageously bought "*au vu.*" The personal and simultaneous presence of buyer and seller, the individual and fragmentary nature of the sales, and the almost exclusive use of ready money are characteristic features. They suit the economic life of the region, and the fair flourishes. To a limited extent the Goncelin fairs attract attention over a wider area. Outside causes are generally determinants in such cases. Thus, in 1909-1910 the great epizoötic that ravaged Italian cattle caused a considerable movement of stock from Goncelin across the Alps.

Unlike most fairs, those of Goncelin are unconnected with religious rite or festival, and the town itself derives little benefit from them. Nomad merchants who establish themselves on the fair grounds are exclusively patronized, and the comparatively short journeys entailed on the part of most of the frequenters of the fairs preclude the necessity for inns. Hence the fairs appear as a very distinct economic phenomenon. (See A. Allix: La foire de Goncelin, *Travaux de l'Institut de Géogr. Alpine,* Vol. 2, No. 3, Grenoble, 1914.)

Russian Fairs. As a vehicle of trade in western Europe the fair has been practically extinguished or unrecognizably transformed: in the east it still remains a prominent commercial feature. Present-day Russia numbers some 16,000 fairs. Most of them, about 87 per cent, are merely local agricultural affairs with a business turnover of under $5,000. These continue to flourish, especially in the more eastern provinces, where communications have been less improved, where population is scanty and capital small. All the larger fairs have declined. Only one per cent of the total number does a business exceeding $50,000, and that of the greatest, Nizhni-Novgorod, placed at $65,000,000, is little more than two-thirds that of the maximum of thirty-five to forty years ago.

Like that of most other famous Russian fairs the history of this greatest one goes back several centuries. From the tenth century the banks of the Volga between the Oka and the Kama have been a meeting ground, pacific and otherwise, for Slav and Tatar. In the mid-seventeenth century the fair acquired a fixed locus under the care of the monastery of St. Macarius. The combination of spiritual and temporal interests was a characteristic feature in the evolution of this form of trading. In the earlier nineteenth century the fair was transferred to its present site 70 miles farther upstream and there became the foremost mart of its kind in the country. The site is ideal. South, the 1,450 miles of the Volga are open to steam navigation. East, the Kama gives access to the Ural provinces, and, west, the Oka extends the Muscovian sphere of influence. North, canal and river make connection with Petrograd and Archangel. The fair occupies the strip of ground lying between the Volga and Oka at their confluence. It is connected with the permanent town on the hills across the Oka by a bridge of boats annually replaced in June and removed on the approach of winter. (For views of the fair, see Figures 2, 3, and 5 of the first article in the April *Review.*) Transactions at the fair depend to a large extent on the nature of the harvest that governs the date of the fair. It is in session from the end of July to the first part of September, though most business is done during the second fortnight of August. Then the temporary population is estimated to amount to four hundred thousand. While the merchandise of the fair remains infinitely varied, some of its former important products have declined in prominence. This is particularly the case with furs, tea, and raw cotton. The opening of the Suez Canal and railroad progress in western Russia reduced the importance of Nizhni-Novgorod as an entrepôt for the overland trade with China. The fur trade has diminished with that of Irbit and others on which it is dependent.

Irbit, ranking second among Russian fairs, is primarily a mart for furs and hides. Twenty or thirty years ago it was estimated to attract approximately a hundred thousand visitors, that is a temporary winter population about twenty times as large as the fixed population of the town. Since the construction of the Trans-Siberian railroad and the growth of direct business between fur companies and foreign markets the fair has

declined, though the high prices and keen demand of the 1916 market sent the gross return on furs up to $1,500,000—nearly double that of the previous year.

Details of the trade may be found in *Commerce Reports* (Nos. 119 and 123, Washington, 1916). A descriptive and statistical article on Russian fairs in general appears in the new Russian-American trade journal *Russia* (The Great Fairs of Russia, *Russia,* June, 1916, pp. 12–23, New York). This may be compared with the account in "La Russie à la fin du 19e siècle" by M. W. De Kovalevsky, Paris, 1900.

AFRICA

The Physical Subdivisions of Southwest Africa. A prompt illustration, in the domain of geographical publications, of the change of sovereignty brought about by the war in German Southwest Africa is furnished by a recent report of the Geological Survey of the Union of South Africa on that one-time German colony (P. A. Wagner: The Geology and Mineral Industry of South-west Africa, *Memoir No. 7,* Pretoria, 1916; [in English and Dutch]). A discussion of the physical divisions of the region forms the most interesting part of the report. This, together with the accompanying map in 1:6,000,000, is mainly based on the text and map of Leonhard Schultze's geography of German Southwest Africa in Hans Meyer's "Das Deutsche Kolonialreich" (2 vols., Leipzig, 1910; section in Vol. 1, pp. 131–298). The following six divisions are established:

The first region, the Namib, is the strip of coastal desert from 15 to 85 miles in width. In topographic expression it varies from a waste-cloaked plain in the neighborhood of Walvis Bay (this is the form of the name now authorized by the government; see Charles Pettman: An Inquiry into the Derivation of Certain South African Place Names, *South African Journ. of Sci.,* Vol. 12, 1915, No. 5) to a series of valleys paralleling the coast on the south. The latter has lately acquired fame through the discovery of valuable diamond deposits. A predominant feature of the coastal belt are the great sand ridges (barchans) piled up by the prevailing south-southwesterly winds to heights that reach 700 feet and constitute a menace to transportation by reason of their rapid movement. Their crest-forms are frequently modified by occasional strong winds from the north. Aridity is the keynote of the geography of the coastal belt. Swakopmund has a mean annual rainfall of 0.89 inches, Walvis Bay of 0.3 inches. Perennial streams reach the coast, but the dry beds of the intermittent torrents will commonly yield water at no great depth. Fogs are characteristic of the immediate shore. To a considerable degree this aridity is due to the cold Benguella Current. The phenomenon in its physical aspects and human responses is comparable with the Atacama Desert of corresponding latitudes in South America. Fish and a deep-rooted species of the pumpkin and melon family constitute the staple food of the tribes inhabiting the Walvis Bay territory (*Journ. South African Soc.,* Vol. 15, 1916), a diet comparable with that of the fish-eating Changos and the Llipis Indians of the Atacama Desert. Marcoy found the latter living solely upon seaweed, water-melons, and shell fish (Travels in South America, Vol. 1, New York, 1875). The small islands lining the shore have been exploited for guano like the Lobos Islands off the Peruvian coast. The prospective value of these deposits was indicated as early as 1861 by the explorer Andersson, to whom we owe an excellent description of the entire Southwest African area (The Okavango River, by C. T. Andersson, New York, 1861). Since 1908 the diamond workings of Lüderitz Bay and the interior neighborhood have introduced problems of water-supply and transportaion similar to those of the Chilean nitrate fields.

From the center of the desert a transition belt leads eastwards to the central highland region of (2) Damaraland. The average rainfall is stated to be 15 inches, but it varies greatly from place to place. At Waterberg a rainfall of 40 inches has been recorded. In years of good rainfall the alluvial soil of the valleys proves excellent for cultivation. Such is the case with the important Windhuk Valley. From the central region isolated ranges superimposed on the plateau run northeast towards Otavi and northwest into the Kaokoveld. Between them and eastward the country merges into the Kalahari Plains. Southward it develops features of the *inselberg* type. South of Damaraland is (3) the plateau of Great Namaqualand, semi-desert and apparently best suited for sheep and ostrich farming. The region is characterized by extensive faulting and great erosion canyons. The dolomite formation of the Otavi region gives a distinct unit, (4) the Karstfeld. The most important of its numerous sink holes is the Otjikoto See, containing in normal years 600 feet depth of water but subject to great fluctuations under varying rainfall. The region is well grassed and the northeastern part appears to be suited to corn and tobacco cultivation, though even here good crops can only be depended on once in three years. Between the northern part of the coast zone and the Kalahari lies (5) the broken country of the Kaokoveld,

forming the dissected rim of the western plateau. Most extensive of all is (6) the Kalahari. The Kalahari includes northern and eastern areas of interior drainage to salt pans; a northeastern zone, the Caprivi Belt, hot and unhealthful, draining to the Zambezi, and a small unimportant tract in the extreme south draining to the Orange River. Over the greater part of the Kalahari the typical topographic form is the sandveld—old dunes evidently formed during times of north or northwest winds and now generally fixed by vegetation. Northward and eastward trees become more numerous and the sandveld gradually passes into tree-steppe.

South African Coast Temperatures. A paper on "South African Coast Temperatures" was read by Dr. J. R. Sutton before the Royal Meteorological Society (London), on February 16, 1916 (*Quart. Journ. Roy. Meteorol. Soc.*, April, 1916). A study of the mean monthly maximum and minimum temperatures for several stations leads the author to the conclusion that the night temperatures of the coast are determined almost entirely by inland conditions, whereas the day temperatures are modified by the sea. An explanation is sought in the lowering of the surface temperature of the sea by the churning effect of the spring gales. R. DeC. Ward.

ASIA

Cyclonic Rainfall in Japan. The distribution of rainfall around cyclones has often been discussed, but a study of the causes which determine this distribution has largely been neglected. Recently, Messrs. T. Yokota and S. Otuki, students in the Science College of the University of Tokyo, have undertaken a statistical investigation of this problem in Japan. The chief data were the Japanese daily weather maps from January, 1905, to December, 1915. The general facts of rainfall distribution over the islands are summarized for various positions of the cyclonic centers. A theoretical discussion of the problem leads to the conclusion that the secondary influences which produce the unsymmetrical distribution of cyclonic precipitation are as follows—(a) the change of temperature with latitude: this tends to locate the center of rainfall on the southeastern side of the low center (in the northern hemisphere) if other conditions are uniform; (b) the temperature contrast between land and water: this influence differs widely according to the season and according to the humidity of the land; (c) the influence of the topography (Torahiko Terada: On the Distribution of Cyclonic Precipitations, *Journ. Coll. Sci. Tokyo Univ.*, Vol. 37, 1916; abstracted in *Monthly Weather Rev.*, Vol. 44, 1916). R. DeC. Ward.

Opening of the First Persian Railroad. Tangible effects of Russia's ever-growing influence in Persia are manifested by the opening, on March 7, 1916, of the first railroad built in the country. The 6½-mile line leading out of Teheran toward Resht, which was built in 1888 and has often been mentioned under the heading of Persian railroads, was in reality nothing more than a street conveyance. Afghanistan now remains the only independent state without a single mile of railway in Asia. According to *Commerce Reports* for April 28, 1916 (pp. 372-373) the new Persian line starts from the boundary with Russian Transcaucasia at Julfa on the Arax River and extends as far as Tabriz, a distance of 93 miles. The ordinary three-day carriage journey between these two points is reduced to a twelve-hour railroad ride. The tracks run parallel to the wires of the Indo-European telegraph system which connects India with European points. The gage adopted is of the broad Russian type, and the line is under Russian management. A branch line diverges westward to Lake Urmiah from the town of Sofian at a distance of 25 miles north of Tabriz.

A readjustment of transportation facilities is likely to follow the inauguration of this line. It is expected that the ancient caravan route of penetration into Persia from Turkey, of which Trebizond was the terminal, will be abandoned in favor of the railway route through Tiflis and other points in the Caucasus. Much of the trade which was conducted through the Persian ports of the Caspian Sea will likewise be deflected toward the railroad. It looks as if Tabriz will be converted, during the next few years at all events, into the great entrepôt, not only of Persia, but of the whole plateau of Iran.

The prolongation of the line south and east from Tabriz may follow without great delay. The objectives are connection with the Indian railway system in Baluchistan and extension to the shores of the Persian Gulf. The important towns of Hamadan, Teheran, and Isfahan lie in the path of these extensions.

POLAR

Mikkelsen's Explorations in Northeastern Greenland. Mikkelsen's expedition of 1909-1912 was sent out to find the records of the ill-fated Mylius-Erichsen expedition of 1906-1908. Lieutenant Trolle's brief and striking account of the original expedition

(*Geogr. Journ.*, Vol. 33, 1909, pp. 40-61) aroused widespread interest. The fate of the leader was known, but it was hoped that his diaries and sketches might still be recovered; and it had not been determined where he made his last camp. Mikkelsen's first report (*Geogr. Journ.*, Vol. 41, 1913, pp. 313-322) contained his chief results. In the same year he published a book entitled "Lost in the Arctic" (reviewed in *Bull. Amer. Geogr. Soc.*, Vol. 45, 1913, p. 862). His final report, entitled "Report on the *Alabama* Expedition to North-East Greenland, 1909-1912," has now been published and reaches the Society as a reprint from *Meddelelser om Grønland* (Vol. 52, pp. 1-143, Copenhagen, 1915).

Though his main object was to recover the note-books and other records of the Mylius-Erichsen expedition, there was time for a large amount of sketching and observation. The report has therefore great scientific value.

On Mikkelsen's first search expedition the grave of Brönlund was found where Koch had buried him in 1908; but nothing was found of either Erichsen or of Hagen, who died with him.

The second search expedition was one of the most daring in the history of Arctic exploration. Mikkelsen's plan was to sledge from Shannon Island (75° N.) to Danmark Fiord (81° N.), on the extreme northeast coast of Greenland, by way of the inland ice, then around Northeast Foreland and down the outer coast where Mylius-Erichsen did his survey work, and back to Shannon Island (for the northern part of this area see the map in the June *Review*, p. 450, and the small map illustrating the item below). The distance was about 1,400 miles, with only five depots on the way and these far apart. Mikkelsen gives a detailed account of his plans, equipment, and food supplies. Of the five men in the party only Iversen was to accompany him to Danmark Fiord and back. These two men made about three-fourths of the journey alone.

Mikkelsen hoped to find the bodies of the two explorers and their records on his way back south; meanwhile there was a chance that he would recover records they might have left, possibly in Danmark Fiord. For a long distance north he chose the inland ice as a highway. The undulations in the surface of the ice made it a rugged sledge route. The ice slopes towards the coast and is gullied into deep channels by large streams of water. Nunataks diversify the landscape for half the route between the point where the party struck the main ice sheet northward to its termination at the head of Danmark Fiord. They are ringed with crevasses and in turn crossed at right angles by still deeper cracks that converge toward the nunataks. The elevation of the inland ice along the line of traverse was from 2,000 to about 3,500 feet above the sea.

On emerging from the inland ice Mikkelsen followed the western shore of Danmark Fiord. Here he found, several journeys apart, two cairns, each containing a statement of progress by Mylius-Erichsen, which are reproduced in facsimile in the report (Pls. VII and VIII). In the earlier of the two letters, dated August 8, 1907, Mylius-Erichsen described his journey westward to Peary's Cape Glacier and his discovery that "Peary Channel does not exist; Navy Cliff is connected by fast land with Heilprin Land. We renamed Independence Bay 'Independence Fiord' and built a cairn (with report) on a low point near Cape Glacier. On the way out through the fiord we discovered and investigated two side fiords, 'Brönlund's fiord' towards the northwest and 'Hagen's Fiord' towards the southeast" (p. 86). Mikkelsen gives much space to an attempt to reconstruct the probable route of Mylius-Erichsen to the place where he and Hagen died. He believes they perished in a fiord in the northern part of Lambert Land and that their bodies and their records sank with the melting of the ice.

The report notes the comparative sparsity of vegetation and animal life on the east coast in latitudes corresponding to the Cape York-Etah regions on the west coast, where animals and especially birds are numerous. An extraordinary abundance of life is noted at the edge of the great ice cap. "We had expected to find a very desolate country when we came down from the inland ice, but we were agreeably surprised to find a vegetation so luxuriant that we had seen nothing like it north of Danmark's Havn.

"Large tracts were covered by a layer of moss, so thick that it felt quite elastic under our feet, and furthermore we noticed several kinds of grasses, some of which had a length of 30 centimeters and covered areas so large that they gave the impression of fields. Not only the valleys but also the slopes of the hills were quite covered with vegetation, moss, grass, heather, and willows, the trunks of which were as thick as a thumb and a decimeter high.

"A large number of animals found their means of existence on this luxuriant vegetation, and the first traces of animal life we found only 25 meters from the foot of the snow-bank over which we came down" (p. 68).

Peary found many traces of former inhabitants in northeastern Greenland, and the Danish expeditions have greatly extended the first meager observations. In addition, Mikkelsen notes their former occupation of Pendulum Island and Bass Rock, lati-

tude 74½° N. Those in the north, 81° to 82° N., appear to have depended chiefly on an abundance of musk-oxen. Those in the south probably depended to a greater degree upon the sea. A number of fox traps, meat caches, shelters, and tent rings were investigated. In eastern Greenland traces of former Eskimo habitations coincide almost everywhere with the limits of range of land animals, and these in turn depend upon ice-free land a part of the year and at least a thin cover of vegetation. This fact lends great interest to the large extent of ice-free slopes in Peary Land where the northern limits of former Eskimo occupation may some day be traced.

Revised Survey of the Head of Danmark Fiord, Northeastern Greenland. Danmark Fiord is the deep re-entrant whose waters wash the western shore of the peninsula which juts farthest seaward from Greenland's northeastern coast. The true proportions of this major depression have only now come to be realized, as a result of surveys made by Mikkelsen on the expedition described in the preceding note. From the inland ice to the mouth of the fiord its axis measures about 115 miles. This, in Greenland, makes it comparable only to the adjoining Independence Fiord, about 105 miles long according to Rasmussen's recent determination of its head (see the June *Review,* p. 449, and map, p. 450), and the dendritic fiord region about Scoresby Sound on the east coast in 70° N., and places it among the world's longest fiords (Sogne Fiord, Norway, 112 miles; Lynn Channel-Chatham Strait, Alaska, 230 miles).

FIG. 1—Sketch-map showing revised survey by Mikkelsen of the head of Danmark Fiord, based on *Meddelelser om Grønland,* Vol. 52, Pl. I. Scale, 1:3,850,000.
The map on the same scale in the June *Review* (Vol. I, p. 450) should be corrected accordingly for this region.

Its representation on a map goes back to Lieut. N. P. Høeg-Hagen's survey in 1907 on the Mylius-Erichsen expedition. The only form in which this survey has been preserved is in two rough pencil drawings, which are reproduced in facsimile as Plates IV and V of *Meddelelser om Grønland,* Vol. 51, No. 1, 1913. The two drafts are on the same scale (1:500,000) and of the same area: the earlier (Pl. V) is, however, somewhat fuller and shows the sights taken from the various observation points as well as the extent of the inland ice, while the latter, cleaner draft (Pl. IV) gives the coastal outline only and the names of the larger geographic features. These maps were found with the Eskimo Brönlund's body on the search expedition led by Lieut. J. P. Koch in March, 1908, that determined the tragic fate which, the November before, had overtaken Mylius-Erichsen and his two companions, Hagen and Brönlund. They were not intended to serve as the final maps. When, in their last straits, the three men realized, however, that they might not be able to reach the ship, it is probable that they so divided the records among themselves that, whoever survived, the main results of their work would reach the outside world. Brönlund carried his own diary and the two rough maps. These, together with the two letters of Mylius-Erichsen which Mikkelsen found, as related in the previous item, are the only available sources for the geography of Independence and Danmark Fiords, the most important region explored by the expedition.

In view of the preliminary nature of Hagen's maps, it is not astonishing that they have developed to be incorrect with regard to a portion of the area. On Mikkelsen's sledge journey north in the spring of 1910 (see preceding item) he descended from the inland ice by way of Danmark Fiord. He thus had an excellent opportunity to survey the region about the head of the fiord. His survey is laid down on a map in 1:650,000 constituting Plate I of Volume 52 of *Meddelelser om Grønland,* published in 1915, which is reduced in the accompanying figure (according to which the corresponding portion of the map in the June *Review,* p. 450, should be corrected). The salient

point is that Mikkelsen shows the head of the fiord to trend in practically the same direction as its lower part, i. e. north-northeast, while Hagen represented it as occupying an east-west position. The account given in Mikkelsen's report (*op. cit.*, pp. 77-78) of the methods of surveying used and the checks applied leave no doubt as to the correctness of his representation. As showing Mikkelsen's original faith in Hagen's map it may be mentioned that the map accompanying both his preliminary account and his book (see preceding item) in each case shows the head of the fiord oriented according to Hagen, a circumstance which forced Mikkelsen to swing the representation of his route over the inland ice westward in order to strike the fiord at the proper point. At that time Mikkelsen's observations had probably not been worked out with the finality which characterizes the present report.

The question naturally presents itself, How is it that Hagen's map, which otherwise has proved so correct in spite of its general and sketchy character, should be unreliable with regard to this region? The facsimile (Pl. V) suggests a possible explanation. The line of sight shown on it radiating from the observation point near Gundersteddal on the western shore of the fiord (see the accompanying figure for place names) include two bearing south-southwest. One of these, if prolonged, strikes Cape Viborg on the eastern side of the fiord. The other, which forms an angle of only 3° with the first, is only half-heartedly drawn and, if prolonged, strikes no prominent point. It might be that, with the primitive means at Hagen's disposal—some of the sights are evidently not even drawn with a straight-edge, but freehand—these two lines were meant to represent the same sight and it was a matter of chance as to which one was used. The position of Cape Viborg was, it seems, determined by the intersection with a sight from an observation point a little farther south, near Pinseskaeret Island. If the first line of sight from Gundersteddal be selected, the sight from Pinseskaeret intersects it at a point which would give Cape Viborg a position 10 kilometers farther north, in close agreement with Mikkelsen's determination. If now the few sights that Hagen was able to take in the uppermost section of the fiord were tied up to the position of Cape Viborg as he had drawn it, instead of where it actually lies, then this alone would account for a shifting of the axis of the upper fiord by about 30° to 40°, or from east-northeast to north-northeast.

In any case, the fact that the region lies on the outer edge of the area surveyed and that its representation is based on long sights and acute intersections would sufficiently account for the possibility of error. The error consists, it should be noted, mainly in faulty orientation of the whole area; the details are in general correct.

This latter point is illustrated by the region above the head of the fiord. On Hagen's earlier draft (Pl. V) a valley is shown parallel on the north to the head of the fiord and draining a small lake above. On his later draft (Pl. IV) this lake has lengthened to 75 kilometers and is designated Fyn Lake (Mikkelsen uses "Fyen"; both are native forms for the Danish island of Funen, after which the lake was evidently named). Although Amdrup in his discussion of the maps (*op. cit.*, Vol. 41, p. 222) designates Plate IV as the later and more carefully executed version and has used it as the basis of the official map of the regions explored by the expedition (*op. cit.*, Vol. 46, No. 2, Pl. IV, 1:1,000,000) he makes an exception for the lake and here follows Plate V. Mikkelsen's expedition, however, has shown that Hagen's later chart (Pl. IV) was substantially correct. There is a lake here, some 28 miles long and from 2 to 5 miles wide. It draws its waters from the melting of the inland ice, at which it heads, and is separated by a morainic dam from Danmark Fiord.

GEOGRAPHICAL NEWS

Personal

Prof. Joseph Barrell of Yale University received the honorary degree of Doctor of Science at Lehigh University on the occasion of the commencement exercises in June celebrating the fiftieth anniversary of the founding of the institution.

Rev. T. A. Bendrat, known for his geographical and geological work in Venezuela, started in July on an expedition to the headwaters of the Orinoco River to explore its sources and the surrounding region.

Dr. Frank M. Chapman of the American Museum of Natural History has left on an expedition to the Andes for the summer to secure the setting for habitat groups of several birds in South America, including the condor and the rhea. Doctor Chapman is accompanied by Mr. George K. Cherrie and Mr. Leo E. Miller. Mr. Miller, it will be recalled, contributed an article on the Gy-Paraná River to the March number of the *Review*.

Dr. John M. Clarke, state geologist of New York, received the honorary degree of Doctor of Science at the quarter-centennial celebration held at the University of Chicago, June 2-6.

Dr. J. Walter Fewkes of the Bureau of American Ethnology is engaged in archaeological and ethnological field work northeast of the Hopi villages in northern Arizona.

Prof. A. W. Grabau at the annual dinner of the Geological Journal Club, Columbia University, on May 17, was presented by the students and members of the departmental faculty with a copy of Suess's "The Face of the Earth" in commemoration of the completion of fifteen years of active service as a teacher in Columbia University and as a philosophic student of geology.

Prof. H. E. Gregory of Yale University spent the winter of 1915-1916 in the Australian deserts. In June he returned to New Haven.

Prof. J. W. Harshberger of the University of Pennsylvania conducted an illustrated science conference on "Field Research in Plant Geography and Ecology" on April 22 at the Brooklyn Institute of Arts and Sciences.

Sir Thomas H. Holland, F.R.S., professor of geology in the University of Manchester, has been appointed chairman of the commission which the British Government is forming to survey the economic resources and industrial possibilities of India.

Dr. C. F. Marbut, Chief of the Bureau of Soils of the U. S. Department of Agriculture, received the degree of Doctor of Laws at the commencement exercises of the University of Missouri in June.

Prof. T. P. Savage and Dr. F. M. Van Tuyl of the department of geology of the University of Illinois are engaged on a geological expedition to Hudson Bay to last until the middle of September. The region south of the Churchill River will be examined.

Mr. J. W. Slaughter, recent lecturer on sociology at the University of London, gave a paper on "Is There a Need of More Reality in the Elementary School Curriculum in History and Geography?" before the meeting of the National Educational Association in New York City, July 1-8.

Mr. R. F. Stupart, Director of the Meteorological Service of Canada, received the honor of knighthood on the occasion of King George's birthday.

Obituary.

Commander H. L. L. Pennell, who was killed in the naval battle of Jutland Bank on May 31, was one of the officers of the *Terra Nova* of the British Antarctic Expedition of 1910.

GEOGRAPHICAL PUBLICATIONS

(Reviews and Titles of Books, Papers, and Maps)

For key to classification see "Explanatory Note" in the July number, pp. 77-81

NORTH AMERICA

United States

Western States

Cory, H. T. **The Imperial Valley and the Salton Sink.** With introductory monograph by W. P. Blake. xiii and 439 pp. (pagination not consecutive); maps, diagrs., ills. John J. Newbegin, San Francisco, 1915. $3.50. 9 x 6.

Although this volume is in part a compilation, its main feature is a paper entitled "Irrigation and River Control in the Colorado River Delta," read by the author before the American Society of Civil Engineers (the 368-page reprint of which from Vol. 76 of the Society's *Transactions* is, with its own pagination, bodily incorporated). It deals with the engineering problems incidental to the development of what may without undue exaggeration be described as one of the potentially richest regions within the confines of the United States. Mr. Cory was prominent in rescuing the reclamation project from the impending overwhelming disaster which threatened it for a while and resulted in the formation of the present Salton Sea. Although this portion of the book was written primarily for a technical audience, it brings out clearly the various problems which faced those who were responsible for and those who overcame the threatened destruction. Lack of adequate knowledge concerning the behavior of the Colorado in its seasons of flood, restriction of choice in the site for the diversion works, and the imperative necessity for supplying an ever-growing population with a constant supply of water for its domestic and agricultural needs were the factors which, in combination with unusual floods, caused the irruption; and the need for rapid decision and action when the situation was almost beyond control was responsible for the heroic but unorthodox methods employed for closing the break. The author sounds a note of warning as to the importance of safeguarding the valley in the future by comprehensive storage projects upon the upper Colorado and a working agreement with Mexico for its control in the delta.

Of the contributed papers and abstracts which form a part of the volume the most notable is one from the pen of the late Professor W. P. Blake, who first examined and reported upon the Colorado Desert in 1853. Professor Blake was one of the true scientific pioneers of the West, standing amongst the highest in his chosen domain of economic geology, and his paper proves how accurate was his original estimation of the physiography and potentialities of this new region.

Professor Blake's paper was originally prepared at Mr. Cory's request to accompany his article on the Colorado delta. The publication by the Carnegie Institution of a monograph on the Salton Sea in 1914 (*Publ. No. 193,* reviewed in *Bull. Amer. Geogr. Soc.,* Vol. 47, 1915, pp. 885-886) made its inclusion in that volume desirable, and the proper permission was secured. As there published some sections were omitted, while the present version is complete. In turn, the present volume has borrowed from the Carnegie Institution's publication Dr. W. H. Ross's chapter on the chemical composition of the water of Salton Sea and the reviewer's notes on the geographical features of the Cahuilla Basin, of both of which abstracts are given.

The memory of a western community concerning its own inception and development is in general but a fleeting and inaccurate one, and it is well that the record should have been made in this case, both as a statement of important facts and an accessible source of valuable data, when the progressive upbuilding of the deltaic region shall bring about the seemingly inevitable struggle with the Colorado for final supremacy.

Godfrey Sykes.

Goddard, P. E. **Indians of the Southwest.** (Handbook Series, No. 2.) 191 pp.; maps, diagrs., ills., index, bibliogr. American Museum of Natural History, New York, 1913. 50 cents. 8 x 6.

A clearly written and amply illustrated outline of the leading features of southwestern ethnography. The introduction, in giving a brief environmental setting, points

out the isolation of the Southwest—cut off on practically all sides by natural barriers: by the Staked Plains from the culture of the Great Plains; by the desert country of northern Mexico from the home of Aztec civilization in the Valley of Mexico; by the Colorado River and Desert from the culture area of the Californian coast; and by mountain barriers from the Ute of the Great Basin. Separate chapters are devoted to the Pueblo peoples, ancient and modern, and the nomadic peoples, the latter term including all non-pueblo-dwelling tribes, i. e. those belonging to the Athapascan, Piman, Yuman, and Shoshonean linguistic stocks. In conclusion there is a short discussion of the origin and relations of the two entirely dissimilar cultures embraced in the single region of the Southwest. They represent two solutions of the problem of adjustment to environment in an arid region and show relations analogous to those existing between the nomad bedouin of Syria and Egypt and the settled *fellahin* of the oases.

Bartell, M. J., and R. P. McIntosh. **California rainfall and runoff and recent floods.** *Engineering News,* Vol. 75, 1916, No. 15, pp. 686-688.

Burke, Edmund, and R. M. Pinckney. **A report on Montana climate.** 65 pp.; maps, diagrs. *Montana Agric. College Exper. Sta. Bull. 55.* Bozeman, 1914. [Diagrams and tables, with discussion, of precipitation and temperature, with emphasis on the former. There are diagrams giving the monthly average precipitation by five-year periods from 1891 to 1910 at 20 to 38 stations according to the number existing at the time.]

Butler, B. S., and V. C. Heikes. **Notes on the Promontory district, Utah.** 10 pp.; map, diagr. *U. S. Geol. Surv. Bull. 640-A.* Washington, 1916.

Butler, B. S., and G. F. Loughlin. **A reconnaissance of the Cottonwood-American Fork mining region, Utah.** With notes on history and production by V. C. Heikes. Map. *U. S. Geol. Surv. Bull. 620-I,* pp. 165-226. Washington, 1915.

Campbell, D. H. **Plant distribution in California.** Ills. *Scientific Monthly,* Vol. 2, 1916, No. 3, pp. 209-225.

Daniels, Mark. **The Grand Canyon of the Colorado.** Ills. *Amer. Forestry,* No. 268, Vol. 22, 1916, pp. 202-208. [Touristic description by former superintendent of National Parks.]

Durst, D. M. **Physiographic features of Cache Creek in Yolo County.** Maps, ills. *Univ. of California Publs. in Geogr.,* Vol. 1, 1916, No. 8, pp. 331-372. [Cache Creek is an antecedent stream draining Clear Lake eastward into the Sacramento Valley. The headwaters lie well to the west of the main crest-line, differing in this respect from any other stream of the Coast Range.]

Dury, Charles. **Natural history notes of southern Arizona.** *Journ. Cincinnati Soc. of Nat. Hist.,* Vol. 22, 1916, No. 1, pp. 4-13.

Hill, J. M. **Notes on the fine gold of Snake River, Idaho.** Map, diagr. *U. S. Geol. Surv. Bull. 620-L,* pp. 271-294. Washington, 1915.

Lee, W. T. **The Aztec gold mine, Baldy, New Mexico.** Map, diagrs. *U. S. Geol. Surv. Bull. 620-N,* pp. 325-330. Washington, 1916.

—— **Los Angeles County in California, Flood control in—I.** Map, diagrs., ills. *Engineering News,* Vol. 75, 1916, No. 6, pp. 272-275. [Abstract of a report of the board of engineers.]

—— **Oregon, Water laws of the state of, compiled from Lord's Oregon Laws and Session Laws of 1911 and 1913.** 195 pp. State Water Board, Salem, 1913. [There has been an enormous amount of litigation in the semi-arid West over water rights, as in every dry region of the world where there is a limited supply of water for irrigation. Both ground water and surface water have been the subject of grave dispute. Conflicting judicial decisions have given added trouble. The Oregon water rights were recently codified, and it is now possible to deal with such questions more fairly. Neighboring states have taken similar action and after due notice have finally settled old questions of water rights. There is a great deal of useful geography in this primarily legal document.]

Parker, G. L., and F. B. Storey. **Water powers of the Cascade Range, Part 3: Yakima River basin.** 169 pp.; maps, diagrs., ills., index. *U. S. Geol. Surv. Water-Supply Paper 369.* Washington, 1916. [Sections by Edwin J. Saunders on geologic history, physiography and river history, climate and production of coal, and by Philo M. Wheeler on the settlement and development of the Yakima River basin.]

Reed, W. G. **Report of the meteorological station at Berkeley, California, for the year ending June 30, 1914.** Maps, diagrs., ills. *Univ. of California Publs. in Geogr.,* Vol. 1, 1916, No. 9, pp. 373-439.

ROBBINS, E. C. **The lumber decline in the Northwest.** Ills. *Amer. Review of Reviews,* Vol. 53, 1916, No. 5, pp. 583-588.

STEBINGER, EUGENE. **Geology and coal resources of northern Teton County, Montana.** Maps. *U. S. Geol. Surv. Bull. 621-K,* pp. 117-156. Washington, 1916.

—— ***Maricopa, Arizona, sheet.*** [*Topographic map of the United States.*] 1:62,500. Surveyed in 1903-1904 and 1913; edition of Sept., 1915. U. S. Geological Survey, Washington, D. C. [A portion of the Open Basin region of Arizona, showing striking contrast between steep and rugged mountain ranges and the nearly flat-floored intermontane basins. The abrupt transition from the one type of topography to the other is beautifully shown along the base of the Estrella Range and appears to good advantage in the photograph of the range forming Plate II of Willis T. Lee's paper on "The Underground Waters of the Gila Valley," *U. S. Geol. Survey Water-Supply Paper No. 104.* Both contour map and photograph suggest that the Estrella Range is an exceptionally good example of a maturely dissected block mountain, but no hint as to origin occurs in Lee's description.—D. W. J.]

—— ***(1) Maine Prairie, (2) Dixon, and (3) Saxon, California, sheets.*** [*Topographic map of the United States.*] 1:31,680. Surveyed in 1906; edition of 1916. U. S. Geological Survey, Washington, D. C. [Three adjoining sheets representing the floor of the Great Valley of California not far from the mouth of the Sacramento River. The extreme flatness of the surface is remarkable, the few contours on a five-foot interval failing to show any irregularities of importance. Railroads, roads, and county boundaries seldom deviate from straight lines.—D. W. J.]

MEXICO AND CENTRAL AMERICA

ALFARO, ANASTASIO. **La invasion de langosta.** 7 pp. Reprint from *Rev. de Educación,* 1915, Oct. San Jose, Costa Rica. [Locust ravages in Costa Rica.]

BARROS, C. R. **Nota del consul general de Chile en Panamá sobre el tránsito en el Canal durante el mes de agosto último.** *Bol. Relaciones Exteriores,* No. 63, 1915, Dec., pp. 45-49. Santiago, Chile. [Specifies the Chilean share in Panama Canal traffic.]

—— **Costarica, Repubblica di, Commercio d'importazione ed esportazione fra la, e l'Italia nel 1914.** *Rapporti dei Agenti Diplom. e Consol.,* 1916, March, No. 5, pp. 1-2. Direz. Gen. degli Affari Commerciali, Minist. degli Affari Esteri, Rome.

HILGARD, K. E. **Ueber Geschichte und Bau des Panama-Kanales.** 113 pp.; maps, diagrs., ills., bibliogr. Art. Institut Orel Füssli, Zurich [1915?]. 7 fr. 9½ x 6½. [Emphasis mainly on engineering phase; there is, however, a section on world commerce and how it is affected by the canal.]

—— **Mexico: Its political situation, its resources, and its military strength.** Map, ills. *Scientific American,* Vol. 114, 1916, No. 16, Apr. 29, pp. 450-451, 456, and 457.

—— **Panama Canal, Governor of the, Annual Report for the fiscal year ended June 30, 1915, of the.** xix and 555 pp.; ills.; diagrs. and maps in separate portfolio. Washington, 1915. [The maps include one showing the East and West Culebra and Cucaracha slides on July 1, 1915.]

SANDBERG, H. O. **Central America of to-day—Guatemala.** Ills. *Bull. Pan American Union,* Vol. 42, 1916, No. 2, pp. 218-236.

SOUTH AMERICA

ECUADOR, PERU, BOLIVIA

GREGORY, H. E. **A geologic reconnaissance of the Cuzco valley, Peru.** Maps, diagrs., ills. *Amer. Journ. of Sci.,* No. 241, Vol. 41, 1916, pp. 1-100.

The three chief features of this report are (1) geologic observations, (2) maps, and (3) physiographic facts and interpretations. The geologic data are unusually full and detailed and will prove useful to future students in the interpretation of the geology of the Cuzco region. The topographic map by Bumstead is possibly the best that has ever been made of any part of Peru and forms one of the many valuable results of Professor Bingham's Peruvian expeditions. The physiographic facts and interpretations are disappointing. There are a number of contradictions in critical places in the argument and several serious errors of statement. A mature cycle associated with a relief of thousands of feet could scarcely run its course and leave merely

a few hundred feet of lake sediments on the floor of a structural depression, the present Cuzco basin. Where did the greater part of the sediments go and under what conditions? Did the water leaving the lake bear sediments? There are many assertions with grave implications on pages 36-38, but what is the evidence? At the end we are told that the ancient lake in the basin still awaits investigation. On page 23 there is no distinction made between terraces to retain soil and terraces built primarily to secure irrigable surfaces. The statement on page 8 that "in the latitude of Cuzco . . . . the term Eastern Cordillera and Western Cordillera have little significance" is based upon lack of knowledge. There are available good descriptions which certainly deny this statement of fact. If for *latitude* we should read *longitude,* scores of photographs and a number of maps prove the contrary.

The block diagram, Figure 9, purports to be "based on topographic data from all available sources." Yet in it the Cordillera Vilcapampa is practically extinguished, and the great chain of volcanoes resting on thousands of feet of lava between Cotahuasi and Antabamba is not represented at all. It is contrary to fact to say that the Peruvian plateau is studded with snow-capped peaks (p. 18); and that it is merely "an uplifted erosion surface" (p. 19). On the west (at Cotahuasi) are over a mile of lavas resting on an erosion surface of rugged relief. The top of the lava series is a volcanic plateau of great extent, now in a first cycle of erosion, and still extremely youthful. A chain of volcanoes surmounts it. The most serious criticism relates to the extension over large portions of the Peruvian Andes of conclusions that have a distinctly local application.

EUROPE

General

Frobenius, Herman. **Abriss der Militärgeographie Europas. I. Teil: Die Halbinseln des Mittelmeers.** 137 pp. *Ergänzungsheft zu Petermanns Mitt. No. 184.* Justus Perthes, Gotha, 1915.

Since the present world war is causing us to look at all things through military glasses, so to speak, Lieutenant Frobenius' paper on the military geography of Europe is most timely and will be widely read.

Military geography is considered first in its relation to the other sciences. Then about one-fourth of the paper considers in detail the relation between physiography and military strategy, illustrated by numerous examples and discussions from past wars. Chapter II gives a general survey of Europe as regards geographical location, frontiers, climate, mountain and river systems, traffic lines, theaters and operations of war. The remainder of the paper gives a detailed description of the peninsulas along the Mediterranean, considered in four parts or regions, viz., the Pyrenees and the Iberian Peninsula, the Alpine territory, the Apennine Peninsula and islands, and the Balkan Peninsula. The last two regions are of special interest since they are within the zone of present military operations. The continuation of this study to include the other parts of Europe will be eagerly awaited.

Military geography and political geography are sister subjects. Both must be built up from geography and history as a common foundation. Military geography and a knowledge of terrain are related to each other in the same way as strategy and tactics. The former considers the geographical conditions of the entire theater of possible military operations as a whole; the latter considers in detail topographical and other conditions of a locality in which troops must operate.

The theater of war in its widest sense is the entire territory which may become the field of operations of belligerent forces. It comprises land territories, high seas, navigable waters of belligerents, and frequently territory of weak neutrals. With a common land frontier, the territory between the boundary and the capital usually forms the principal theater. If, however, the boundary is extended, several distinct regions may become theaters of operations. The theater of war is frequently influenced by other than spacial relations. A war may be waged with several not distinctly united adversaries as well as on several fronts. Such a condition is very general among the middle European states, as is the case at present. On the other hand, countries separated from one another by almost insurmountable territorial obstacles may be brought into co-operation by a common speech or origin.

The location of the theater of war is influenced by many considerations, chief among which is climate, which may be modified to some extent by existing fuel supply. Density of population also affects movement, care, and supply of troops, as operations on a large scale always require a large population and an ample source of supplies. The extent of the theater of war is governed by the available highways, railroads, and waterways along

which all movements must take place, and the movements themselves grow complicated in direct ratio with the irregular network of facilities available to either belligerent. On highways the rate depends upon the physical condition of the troops, the character of the roads, and the weather; on waterways and railroads according to the available supply of transportation. These routes are intersected by rivers, marshes, mountains, forests, etc., which further complicate movements. The particular territory which is made the theater of operations depends upon the will of the belligerent who assumes the offensive.

Land frontiers, such as mountain ranges and river courses, which offer natural interference to free and uninterrupted traffic, constitute a real strategic barrier, whereas open frontiers constitute a mere political boundary line. Nevertheless, the latter cannot be disregarded, for peace-time concentrations along such frontiers may be the precursor to aggressive hostile operations. Mere political boundaries are only a product and symbol of peace and may shift during and as a result of each war. The determination of the boundary line presents many difficulties due to attempting to co-ordinate political and physiographic features.

In any actual case favorable and unfavorable conditions of both a natural and an artificial character will be found mingled in an extraordinary variety, and generalizations will be found impossible. There must be considered particularly the relative advantages and disadvantages of mountainous districts, watered and cultivated areas, wooded areas, and land cut up by ditches or canals which may enable it to be overflowed. Mountain passes are strategic places because the invader can pass high ranges only at the passes. Important depots or fortified places on or adjacent to lines of supply have a controlling effect upon operations in their districts. The capital of a country is usually the principal objective on account of the moral effect of its fall and the attendant confusion of the governmental machinery. JAMES GORDON STEESE.

AFRICA

SAHARA, INCLUDING EGYPT

CHUDEAU, R. **L'Azaouad et le Djouf.** Ills. *La Géogr.*, Vol. 30, 1914-15, No 6, pp. 418-436. Paris. [Important new surveys, embodied on a map in 1:2,000,000, made in 1913-14 in the western Sahara from north of Timbuktu to beyond Taodeni. Chudeau's route from the latter place south lay east of Lenz's route of 1880.]

—— **l'Egypte, commerce extérieur de, Bulletin mensuel du.** 35 pp. Direction générale des Douanes Egyptiennes, Vol. 30, 1916, No. 1. Alexandria.

—— **l'Egypte, commerce extérieur de, Bulletin mensuel du.** 35 pp. Direction générale des Douanes Egyptiennes, Vol. 30, 1916, No. 2. Alexandria.

GRENFELL, B. P., AND A. S. HUNT, edits. **The Oxyrhynchus papyri: Part II.** xii and 278 pp.; ills., index. Egypt Exploration Fund, London, 1915. $5.00. 10½ x 8. [One of a series of annual publications dealing with papyri found at Oxyrhynchus, Egypt, and containing rare items of moderate interest to geographers. Such are the scraps of census reports dating back to a time before the Christian era, the accounts of the Nile overflow and ancient irrigation of the gardens, notes on commerce, festivals, and seasons.]

MILNE, J. G. **Greek and Roman tourists in Egypt.** *Journ. of Egyptian Archæology,* Vol. 3, 1916, Part 2, pp. 76-80. [Ancient tourists.]

WEIGALL, A. E. P. B. **A history of events in Egypt from 1798 to 1914.** xiii and 312 pp.; ill., index. Charles Scribner's Sons, New York, 1915. $2.25. 9 x 6.

ASIA

GENERAL

FRYER, JOHN. **A new account of East India and Persia, being nine years' travels, 1672-1681.** Edited, with notes and an introduction, by William Crooke. **Vol. III.** *Works issued by the Hakluyt Society,* Second Series, No. 39. viii and 271 pp.; ills., index. London, 1915. 21s. 9 x 6.

With the appearance of this volume the first reprint in English of John Fryer's narrative of travel comes to a close. The two previous volumes appeared as Nos. 19 and 20 in the Hakluyt series (see *Bull. Amer. Geogr. Soc.*, Vol. 42, 1910, p. 158, and Vol. 45, 1913, p. 208). The work must yield in interest, among contemporary accounts of the East, to the writings of Bernier, Tavernier, and Manucci. But it will always remain a most valuable supplement to these works.

Persia, at the end of the seventeenth century, when it was visited by Fryer, had shown hospitality to the agents of the East India Company under whose protection he traveled. He was therefore able to observe the country from vantage points denied to others. Nevertheless, a lack of sympathy with the natives appears from his lines. He is unable to suppress his westerner's contempt at the display of manners and customs unintelligible to him. This defect may be attributed to his ignorance of native languages. In other respects there is no lack of cordiality in his writings. The dry humor which pervades his book is maintained without the author's relinquishing a somewhat dignified stand.

Fryer's city breeding comes to light in his Indian notes in the form of exaggerations of the arduousness of travel over mountain passes. The "troublesome clambering" of hills from the summit of which delightfully pastoral scenes could be enjoyed with "cows grazing," "goats feeding," "cottages placed near rivulets," strike one as the Londoner's wail lamenting the loss of his comfort.

A commendable feature is the insertion of corrections and new information on subjects considered in the notes of the first two volumes. This fresh material has been embodied in the section entitled "Additional Notes."

—— **Japon, Le, et la Russie: Leurs rapports économiques.** *La Nature,* No. 2211, 1916, Feb. 12, pp. 106-108.

Okada, T. **Some researches in the Far Eastern seasonal correlations (First note).** Diagr. *Monthly Weather Rev.,* Vol. 44, 1916, No. 1, pp. 17-21. [Reprinted from *Journ. Meteorol. Soc. of Japan,* December, 1915, Vol. 34, No. 12.]

Purnell, C. J. **The log book of William Adams, 1614-1619, and related documents.** Diagrs., index. *Trans. and Proc. Japan Soc.,* Vol. 13, 1914-15, Part 2, pp. 156-302. London. [Deals with the voyages from Japan to the Riu Kiu Islands, Siam, and Cochin China of an English pilot who lived twenty years in Japan and died there.]

WORLD AS A WHOLE AND LARGER PARTS

Ijzerman, J. W. **Dirck Gerritsz Pomp, alias Dirck Gerritsz China, de eerste Nederlander die China en Japan bezocht (1544-1604): Zijn reis naar en verblijf in Zuid-Amerika, grootendeels naar Spaansche bescheiden bewerkt.** xv and 195 pp.; maps, index, bibliogr. *Werken uitgegeven door de Linschoten-Vereeniging, IX.* The Hague, 1915. 10 x 7.

This volume consists of two parts, the first containing the narrative, and the second an appendix of Spanish documents forming the sources from which much of the narrative is drawn. The body of the work consists of five chapters, of which the following is a summary:

In the introductory chapter the following questions are discussed and answered by the author: (1) Was Dirck Gerritsz the first Hollander to reach Japan? Answered in the affirmative. (2) Did he open for his compatriots a way to a profitable trade with that country? He did. (3) Did he gather important information concerning the west coast of South America which was later embodied in instructions given to Admiral Jacques l'Hermite when he was about to sail in 1623 with the Nassau fleet? He did. (4) Was Gerritsz Land, or rather the Dirck Gerritsz archipelago, 64° S., discovered by him? To this question the answer is negative.

The reason for this new discussion of Dirck Gerritsz is stated to be the new Spanish sources throwing light upon his character and adventures.

The second chapter discusses the early life of Gerritsz and his sojourn in India. He was born at Enkhuizen in 1544 or 1545. At the age of eleven he was sent to Lisbon to live with his two aunts who had married Dutch merchants there. He attended school for five years and became master of the Spanish language. In 1568 he sailed from Lisbon for the purpose of seeking his fortune in India. Landing at Goa he entered the service of the King of Portugal on the India fleets. In 1582 or 1583, after a profitable trading voyage to China and Japan, he married Johanna Willems*dr* (i. e. daughter) of Brussels. About this time he became acquainted with Jan Huygen van Linschoten, and they soon became intimate and lasting friends. In 1584 he wrote to his parents the letter, published herewith, concerning his voyage to India and the character of the country and its inhabitants. Soon thereafter he made a second voyage to China and Japan. He touched first at Cochin, then at Malacca, next at Macao, where he remained a considerable time. On this peninsula the Portuguese had established a trading colony in 1557 and, despite numerous difficulties with the Chinese authorities, carried on a profitable commerce with Canton on the mainland. Leaving Macao on the 5th of July, 1585, fifteen months out

from Goa, he reached Nagasaki, Japan, in twenty-six days. Gerritsz remained in Japan eight months and did a profitable business; on the 20th of March, 1586, he began his return voyage to Goa, where he arrived in April, 1588.

The expedition had been a success, but Gerritsz had lost his wife during his absence and being further unsettled by a scandal involving a godchild of his, he determined to return to his native land. There he arrived after an absence of thirty-five years with 3,000 ducats in his pocket, and with much to tell that was new and strange.

His journey to South America and return is related in Chapters III to V. Several years passed before Gerritsz again ventured on a long voyage, though this period was marked by a number of notable expeditions that might well have tempted his adventuresome spirit, among these the first voyage to India by rounding the Cape of Good Hope. The success of this venture, even at the loss of one ship and many men, led to many more. In 1598 two fleets sailed for the same destination. While these fleets were fitting out, two other expeditions were organized, one of these commanded by Admiral Oliver van Noort, with the avowed purpose of sailing in a new direction through the Straits of Magellan. The other expedition, it was given out, was to sail around the Cape to India.

The latter expedition claims our chief interest because Dirck Gerritsz (now surnamed China) had been induced to invest money in it and join it in person. He claims to have been ignorant of its real purpose and destination, which was to sail through the Straits of Magellan to Chile and Peru and exchange the cargo for silver; or, failing there, to sail to Japan. Five ships sailed on this venture, steering as if for the Cape until well down the African coast in order to deceive the crews as long as possible. Gerritsz, a passenger on the *De Hope*, the admiral's ship, had at first no definite position, but made himself indispensable as soon as they reached southern waters by his knowledge of Spanish and Portuguese. They stopped en route at Santiago, one of the Cape Verde Islands, and made a hostile landing at Annabom, nearly destroying the Portuguese settlement there. Thence they resumed their voyages January 3, 1599, to the coast of Chile.

A full account of what the five ships encountered as also a report made by Gerritsz himself to Oliver van Noort present a picture of dire distress from hunger and disease during the voyage. Gerritsz, who had been made captain of the *Vliegend Hart* on the death of its former commander, ran his ship, which fierce storms had separated from the rest of the fleet, into the harbor of Valparaiso, where, November 18, 1599, he surrendered ship and lading to the Spaniards.

Chapter IV gives an account of the trial of Gerritsz and five of his companions before the Spanish authorities. It was stated at the trial that the original goal of the expedition was India; that off the coast of Africa it was decided, but without Gerritsz' consent, to sail for Chile; that they had no instruction as to what country they should settle or trade in; that no fleet was being fitted out to follow and assist them. Being asked why he did not await the other ships at Valdivia, as agreed, Gerritsz declared that he had landed at Valparaiso for the purpose of giving himself up in order to serve his majesty the King of Spain.

The above information, never before published, throws new light on the character of Gerritsz. It would seem that he had determined to win his freedom at whatever cost. The Spaniards were at first disposed to believe him, but other information made them suspicious. The ship was confiscated as booty and the crew kept as prisoners. Of the latter's stay in Chile and Peru little is known. Of their return home we get but fragmentary and contradictory accounts. In regard to Gerritsz himself we are informed that he gained his liberty July 1st, 1604. They were all evidently regarded by the authorities as dangerous men, who had left home with hostile designs on the Spanish colonies.

BENJAMIN L. D'OOGE.

HUMAN GEOGRAPHY

ANTHROPOLOGY AND ETHNOLOGY

OSBORN, H. F. **Men of the Old Stone Age: Their environment, life, and art.** xxvi and 545 pp.; maps, diagrs., ills., index, bibliogr. Charles Scribner's Sons, New York, 1915. $5.00. 9½ x 6½.

This is one of the most notable books of the past year. The writer, who is one of the leading authorities on paleontology in the United States, brings to the subject of anthropology the viewpoint of an experienced anatomist. As president of both the New York Zoölogical Society and the American Museum of Natural History, he has had almost unique opportunities to study the mammalian forms most closely related to man. His long training in zoölogy and in somatology has enabled him to give proper weight and credit to the various physical characters of man, and his exact knowledge of the

evolutionary relationship of extinct forms has been of great service in clearly establishing the correlation in time between the various geological horizons in which human remains and artifacts have been found associated with the bones of Pleistocene mammals. This correlation, as laid down by Professor Osborn, constitutes perhaps the most valuable contribution to science contained in the book, but to most readers the wealth of illustrations, the maps, and the lucid descriptions of the successive culture periods, will be matters of great surprise and interest. The science of prehistoric anthropology, dealing as it does with the evolution of man from his ancestors in the Pliocene down to and including the closing phases of the Paleolithic, is of such recent development that each successive book of first-class authority practically incorporates, expands, and brings down to date, the work of its predecessor. With Professor Osborn's work before the general reader practically all older works dealing on the subject may be discarded, except so far as earlier writers have special knowledge of some one particular phase of human archaeology. A number of books have been published abroad in which a modicum of intimate knowledge of some one station or cave has been used as the excuse for a review of the entire field of anthropology, and to such books "Men of the Old Stone Age" is in refreshing contrast.

It is very fortunate, in these days of growing interest in eugenics and in the study of the races of man, that a scientist of Professor Osborn's standing and authority has clearly brought out the unmistakable evidence of the continuity of inheritance throughout vast periods of time.

The race of the Cro Magnons who occupied the stage during the entire Upper Paleolithic, including the Aurignacian, Solutrean, Magdalenian, Azilian subdivisions, appear to have been intellectually and physically the absolute superiors of even the higher European races of today, and in this respect they resembled, in intellect at least, the Greeks.

The bearing of such an astounding discovery on the questions of the present time, especially those relating to the migration of races, which we now call immigration, is clear, and the importance of maintaining the breed and stock of the finer races in unimpaired purity, must in consequence be sooner or later recognized. Theodore Roosevelt recently stated that the publication of this book by Professor Osborn constituted to his mind the one intellectual oasis in the desert of futility and verbiage, both political and intellectual, which has been so characteristic of American life during the last four years.

MADISON GRANT.

GODDARD, P. E. **Language as an index to ancient kinships.** *Amer. Museum Journ.*, Vol. 16, 1916, No. 3, pp. 197-198.

MYRES, J. L. **The influence of anthropology on the course of political science.** *Univ. of California Publ. in Hist.*, Vol. 4, 1916, No. 1, pp. 1-81.

ECONOMIC GEOGRAPHY

Production

CARVER, T. N. **Selected readings in rural economics.** viii and 974 pp.; index. Ginn & Co., Boston [1916]. \$2.80. 8½ x 6.

This is primarily a "source book" for students of agricultural economics. But it is something more than this, for it brings together in available form much material of interest to the general reader, to the student of economics and industrial history, to the interested farmer and the "back-to-the-land" man, who above all others needs practical, authoritative information of a protective nature.

The selections reprinted here are grouped under eight heads: general principles; agricultural history; land tenure; agricultural labor; the farmer's business; agrarian movements in the United States; rural organization and marketing; agricultural policy.

Of these the general reader and the farmer would find most interesting and helpful the first, fifth, and seventh of these sections and, in the second, the passages devoted to American agricultural history. Other individual chapters are equally helpful.

The student of economic conditions and of pressing political questions, such as co-operative marketing and agricultural credit, will find the book stimulating and helpful. It should be remembered, however, that it is a supplementary source volume of greatest value when read in association with some authoritative text on rural economics.

RICHARD ELWOOD DODGE.

THE GEOGRAPHICAL REVIEW

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THE WATER BARRIERS OF NEW YORK CITY

By ELLSWORTH HUNTINGTON

When the world was young men dreamed of the power of the gods. They dreamed that Jupiter could fly to the top of Olympus in the twinkling of an eye; Neptune could plunge beneath the water on the coast of Ithaca and emerge a few minutes later at the mouth of the Tiber; Pluto could cleave the ground asunder and descend to the depths of Hades. Today, man no longer dreams of these things. He does them. He flies in the air at the rate of two miles a minute; he plunges to the bottom of the sea and comes up miles away; he blasts the earth asunder and ransacks its deep places for hidden treasure. Where light-hearted Mercury occasionally lifted some happy mortal and winged with him across a broad river, the ordinary mortal can today shoot across a huge steel bridge in the wake of a snorting dragon.

Because we can do these things we flatter ourselves that we have conquered nature, but have we done it? Has not nature conquered us? Take the water as an example. Look at its effect on New York City. Because of the splendid harbor and the wonderful pathway up the Hudson-Mohawk Valley the city has grown beyond the wildest dreams of its founders. Today, if we include the part of the population on the Jersey shore, the real city is scarcely second to London in size and will soon rival or surpass the British capital. Never before in all history have so much gold, bonds, and other valuables been stored in a single metropolis. Never before was there a city which throbbed with so intense a life. All this depends on the fact that man has conquered the water and made it the highway of the nations.

But look at the other side of the shield. We have conquered the water, but what has been the price? How much does New York pay for the privilege of being located on Manhattan Island and thus having a fine harbor? Every one who comes to the city, together with a large portion of the people who dwell there, must frequently cross one or another of the narrow arms of the sea that surround the island on all sides. We conquer these narrow arms by steam ferries, great suspension bridges, and tunnels deep down in the mud and rock. Do we thus diminish the influence of the water barriers? How much did the barriers cost the average citizen of Manhattan in the

days when there were no ferries, bridges, and tunnels? And how much do they cost him today? If any man thinks that by our boasted cleverness we have lessened the influence even of such small bodies of water as the North River, the East River, and the petty little Harlem, let him count the cost in money, in time, in health, in character. Looked at in any way except as aids to commerce and as a stimulus to invention and activity these little bodies of water are today more of a hindrance than ever before.

New York City, as everyone knows, was founded on the southern end of Manhattan Island. The island is about 13 miles long with a width of about two miles at the south and one mile at the north. It is surrounded by narrow arms of the sea, wrongly called rivers, which are due to the depression and drowning of the coast in recent geological times. The widest arm is the North River, or main Hudson, one mile wide, which separates Manhattan from New Jersey on the west. The second arm, the East River, one-third to two-thirds of a mile wide, lies southeast of the island toward Brooklyn and Long Island. The little Harlem River, from 500 to 1,000 feet wide, completes the water barrier and separates Manhattan from the mainland on the east.

The ferries have always made trouble for New York. At the very beginning, according to I. N. Phelps Stokes in his book on "The Iconography of Manhattan Island," one of the conditions on which Governor Nicolls granted a patent to the town of New Harlem was that it should maintain a ferry to the mainland. The ferry was established across the Harlem River at Harlem, but thrifty travelers preferred to use the road by Spuyten Duyvil, for there where King's Bridge was afterwards built they could wade across. Traders finally brought so many horses and cattle across there that in 1668 the ferryman, apparently having little to do except sit and think of his wrongs, succeeded in persuading the inhabitants of New Harlem to join him in suing for redress of grievances. As a result the ferry was moved to the wading place, where at least it could carry across the people who did not want to join their animals in wading. The following year, 1669, a license was granted in New Jersey to Pieter Hetfelsen to run a ferry between Communipaw and New York. Thus the first formal steps were taken toward overcoming the water barriers of Manhattan.

In 1790, when the first census of the United States was taken, New York City had 33,000 people, and the modern metropolitan district had scarcely 50,000 people where today there are over 5,000,000. How much were the people of 1790 disturbed by the water barriers? Practically none crossed the water to their daily work. Those who crossed the rivers were chiefly the few travelers who passed through the city and the farmers who lived in Jersey or Brooklyn and came now and then in rowboats to sell produce and do a little buying. The largest ferry boats were mere scows. Although it is impossible to obtain figures as to how much the crossing of the water cost the community in 1790, we may be quite sure that for an entire year it was

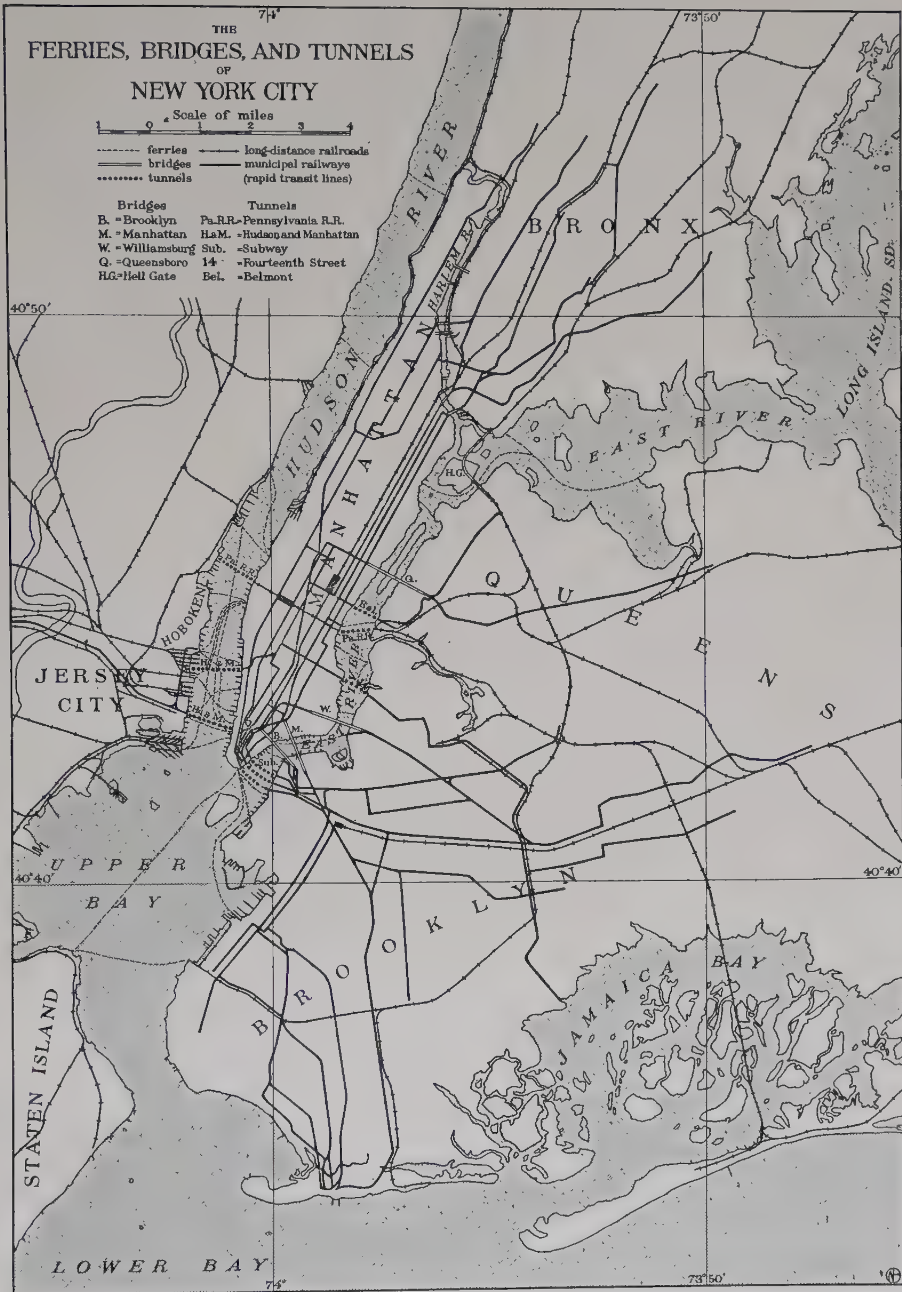

FIG. 1—Sketch-map showing how the water barriers of Manhattan Island have had to be overcome by means of ferries, bridges, and tunnels. Scale, 1:247,000.

only a matter of a few thousand dollars. The milkman may have had to drive a mile or two farther because Manhattan is long and slender, but it is doubtful whether the life of the ordinary New Yorker was appreciably influenced by the fact that he lived on an island rather than on the mainland.

Let us see what the water barriers are doing to New York today. As soon as lower Manhattan began to be densely populated there was trouble. The city was like a growing potato enclosed in a narrow tube. It wanted to expand in all directions, but the only line of growth was northward. Therefore the price of land rose rapidly, for many people wanted the same spot downtown. As Brooklyn and Jersey offered abundant land at prices much lower than in Manhattan, people began to live there and to cross the water to their work. Hence the ferries became important. Today they are a great source of expense not only to the people who use them, but to the municipality and hence to every New Yorker.

Let us estimate the annual expenditure entailed by the ferries. We may well begin with the municipal ferries, which run to South Brooklyn and Staten Island. They were taken over by the city in 1905 and have been operated ever since at a loss. The equipment of these ferries has cost not far from $12,000,000, including boats and especially terminals, which account for about 70 per cent of the cost. To this must be added more than $5,000,000 for the loss in operation from the time when the ferries were taken over by the government to the end of 1914. The interest on $17,000,000 at the rate paid by the city when the ferries were bought and equipped amounts to about $700,000. In 1913 the cost of operating and maintaining the Staten Island Ferry, together with depreciation, amounted to $1,110,000; while the South Brooklyn ferries cost $420,000. Adding together these various items we get a total of $2,230,000 as the cost of the ferries to the city in 1913. This sum paid the interest and carried 1,500,000 passengers to Brooklyn and 12,000,000 to Staten Island.

The municipal ferries are only a small part of those in New York. In 1906, when the last census report on transportation was issued, New York had 152 ferry boats, or 28 per cent of those in the entire country. Their value was $17,000,000, or 58 per cent of the country's total, while the number of passengers was 209,000,000, or 63 per cent of the ferry passengers carried in the United States. Since the building of the tunnels the number of passengers has decreased, but for the year ending in June, 1914, it amounted to 128,000,000 in addition to the 15,000,000 carried by the municipal ferries. The cost of the equipment has not diminished, and, as a result of the development of automobile traffic, more vehicles are carried than ever before. We have no figures as to the operating expenses of the privately owned ferries, but 128,000,000 passengers at the usual rate of three cents each would give $3,840,000 as the amount paid out by the public for this particular item.

Not only passengers but vehicles are carried by the ferries. In 1914 the Staten Island Ferry carried 342,560 vehicles at an average charge of 51 cents apiece, or 10 cents a mile. The revenue from this source was nearly 30 per cent as great as that from passengers. The 39th Street Ferry to Brooklyn, which is the other municipal ferry, carried 458,440 vehicles at an average cost of a trifle over 26 cents per trip, or 9 cents a mile. In this case the revenue from vehicles was three times as much as from passengers, for nowadays people use the bridges and tunnels. As the other ferries carry many more vehicles than the Staten Island Ferry in proportion to the passengers, but probably not so many as the 39th Street Ferry, we may fairly assume that the revenue from vehicles is at least as great as from passengers. Therefore we must add another $4,000,000 to the cost of the water barriers.

Even this does not complete the story. Every vehicle that crosses a ferry must waste at least fifteen minutes and usually half an hour or more if we include the necessary delays and the time lost in going out of the way to get to the ferry. If we count the average time lost on the municipal ferries as half an hour to South Brooklyn and three quarters to Staten Island, its value, on a basis to be stated later, is about $135,000 per year in one case, and $165,000 in the other, or about the same as the ferry charges. On the same basis the value of the time lost by all the vehicles on all the ferries is approximately $4,500,000 per year.

To get the total cost of the ferries we must add the cost of the municipal ferries, $2,230,000 per year; the fares paid by passengers on the other ferries, $3,840,000 per year; the fares paid by vehicles on the other ferries, about $4,000,000; and the value of the time lost by vehicles on all the ferries, about $4,500,000. This makes a total of approximately $14,500,000. Since part of this is based on estimates instead of exact figures we shall come nearer the truth if we say that the ferries cost New York from twelve to sixteen million dollars each year. So much for one item in the expense of the city's water barriers.

The more the New Yorkers have thought about their ferries, the less they have liked them. When one has time and the weather is good, the ferry trip is all right, but when one is in a hurry and it is stormy, some other way of getting across the water is pleasanter. Moreover, it is much cheaper not to have to transfer from one mode of conveyance to another. Therefore agitation for a bridge to Brooklyn was begun years ago. It finally took form in the Brooklyn Bridge, begun in 1872 and finished in 1883. Since then three other great bridges over the East River have been completed. A fifth, the Hell Gate Bridge, which will soon be open, does not cross from Manhattan to Long Island, but from the Bronx. As truly as the others, however, it is a means of overcoming New York's water barriers. With the exception of the bridge over the Firth of Forth in Scotland, New York has the four longest bridges in the world, their length varying from

6,000 to 7,500 feet while that of the Forth bridge is 8,100 feet. The New York bridges, too, have some of the longest spans in the world. Among suspension bridges the Manhattan, Brooklyn, and Williamsburg Bridges, with spans of 1,470, 1,595, and 1,600 feet respectively, are unrivaled. The Hell Gate Bridge, with a span of 995 feet, is the largest arch bridge in existence, the next being the Niagara Clifton Bridge with a span of 840 feet. Among cantilever bridges alone does the palm go elsewhere, for although the Queensboro Bridge has a span of 1,182 feet, it is much exceeded by the Firth of Forth Bridge, whose longest span is 1,710 feet, and the Quebec Bridge over the Saint Lawrence which is now being built with a span of 1,800 feet.[1] It is an astonishing fact that of the world's seven largest bridges five should be in the midst of the world's largest city.

Over the four East River bridges there pass each year six or seven million foot passengers. We will not include them in our estimate of the expense of the water barriers, for in most cases their walk probably does them good. A far larger army of about 120,000,000 people in 1913 and probably 130,000,000 in 1915 rides in surface cars, and about 115,000,000 in elevated trains. There is no way of estimating how much these people pay for transportation, since the fare for the bridges is not separated from the fare on dry land. We can get at the cost in another way, however. The number of round trips made by the surface cars was 3,660,000 in 1913 and close to 4,000,000 in 1915, while the number of round trips of elevated cars was 1,767,000 in 1913 and probably close to 2,000,000 now. The cost of running the surface cars is estimated by the Public Service Commission as about fifty cents for a round trip, while for elevated cars the expense is thirty cents. This means that the necessity of running the cars over the waste space of the four East River bridges costs the transportation companies $2,600,000 a year, which means that it must cost the public not far from $3,000,000.

Large as this sum seems, it is only a beginning. Think how much it costs to drive more than 8,000,000 vehicles across the East River bridges each year. An actual count shows that in a single day in October the four bridges were crossed by something like 7,500 one-horse vehicles, 5,000 two-horse vehicles, 500 three-horse vehicles, and 12,000 motor vehicles. All these vehicles drive much unnecessary distance in crossing the bridges, and in reaching them. Suppose that each one-horse vehicle, including horse, driver, and equipage, is worth $4.00 for an eight-hour day. Such a vehicle may be supposed, on the average, to go at least half a mile out of its way in order to reach a bridge and a mile and a half in order to cross it. That will take half an hour at a moderate estimate, and the cost will be about $675,000 per year. Suppose that the two-horse vehicles, with their drivers, are worth $5.00 a day. As they go slowly, they will not average more than a mile in twenty minutes, and the value of the time which they spend in getting to

[1] For these figures I am indebted to the engineering firm of Lindenthal, New York City.

the bridges and crossing them will be about $800,000. We may suppose that the three-horse vehicles are worth $6.00 a day, which is a decidedly small figure. It will cost them $80,000. Finally, the various types of automobile vehicles may be assumed to be worth at least $10.00 per day. Although they will go faster than the horse vehicles they are subject to such frequent delays that it is safe to say that the average time lost on the bridges is at least ten minutes and probably more. If it is only ten minutes the value of the time thus consumed amounts to not far from $900,000. Thus the long string of vehicles that continually promenades across the bridges, year after year, from early morning until late at night, is obliged to waste time worth about $2,455,000 each year. Since there are a considerable number of other vehicles, such as push carts, not to mention horses that are led across, the total cost of the time lost is at least $2,500,000. This is item number two for the East River bridges.

The third item is maintenance. In 1913, the last year for which reports have been published, the cost of maintaining the four great bridges was about $720,000. To this should be added depreciation, which would be about $580,000 if we estimate the life of the bridges as one hundred years. Finally, the last item in the indictment against the East River is the actual cost of the bridges themselves. The cost of construction was $58,000,000, and that of the land for their approaches about $32,000,000, making a total of $90,000,000. The interest on this at 4½ per cent, which is what the city generally paid at the time when the bridges were built, is $4,050,000. To all this must be added the fact that the mere business of administering the bridges involves an expense of about $120,000 for salaries, offices, and the like.

Here, then, is the annual cost of the four great bridges:—for operating the cars, $2,600,000; for time wasted by vehicles, $2,500,000; for maintenance and repairs, $720,000; for depreciation, $580,000; for interest, $4,050,000; and for administration, $120,000; making a total of $10,570,000.

Not even yet are we through with the bridges. Thus far we have been talking only about the four already completed between Manhattan and Long Island. The fifth, the Hell Gate Bridge, is nearing completion. Its estimated cost, including approaches, is $25,000,000, and it will doubtless add nearly one-fourth to the sum just stated as the total.

New York has also many other bridges. There are at least eight wagon bridges in addition to several railroad bridges over the Harlem River, while in other parts of the city numerous minor bridges cross little bodies of water of no special importance. In 1913 the maintenance of all the bridges, aside from those over the East River, cost $490,000. Their capital cost, including land, was about $31,000,000, which means an interest charge of approximately $1,400,000. There are no figures as to the traffic over these bridges. We may attempt to estimate this by figuring that the traffic per square foot of *area* rather than per foot of *length* is as great on these bridges as on the

East River bridges. Of course many are narrow, so that in proportion to their area they are not nearly so important as in proportion to their length. On this basis the cost of the time lost by vehicles would be about $1,400,000, while the cost of running cars and trains on the bridges would be about $1,500,000. Depreciation on the basis of one hundred years of life for each bridge would be $170,000. Adding these figures we get $4,960,000 for the minor bridges. With the East River bridges this makes the enormous total of $15,530,000 for the bridges actually in operation, while the new Hell Gate Bridge will bring the total not far from $18,000,000. This, it must be remembered, is what the bridges cost the city each year.

Ferries and bridges are only two of the great items in the cost of the water barriers. The third, and probably eventually the greatest, is the tunnels. Thus far New York has seven sets of tunnels in operation. Each consists of two parallel tubes. Three of the tunnels pass under the main Hudson to New Jersey, and four under the East River to Long Island. Although one of the two Hudson and Manhattan tunnels to New Jersey was begun in 1874, it was not opened till 1908. The other Hudson and Manhattan tunnel was opened the next year, while the third Jersey tunnel, that of the Pennsylvania Railroad, was completed in 1910. The East River tunnels are even more recent. The Battery tunnel connecting the Subway with Brooklyn and the Belmont tunnel at 42nd Street were indeed finished in 1908, and the Pennsylvania tunnel in 1910, but the Queensboro tunnel was not opened till 1915, and there are still four more tunnels to be completed to Long Island. It is almost impossible to determine the precise cost of all these tunnels.[2] The Hudson and Manhattan system cost

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[2] The following letter, which was kindly sent me by Mr. T. H. Whitney, Secretary of the Public Service Commission for the New York City District, gives some interesting facts about the later tunnels and also illustrates the difficulties of estimating the cost of the tunnels:—

Since the receipt of your letter of January 8, inquiring for cost data upon the river tunnel sections of our rapid transit railroads, I have been endeavoring to get such information. I find, however, that it is impossible to segregate the figures. The best I can do, therefore, is to give you an approximation.

The existing Battery tunnel of the first Subway was constructed under Contract No. 2, which embraced the Subway from City Hall, Manhattan, south through Broadway to Bowling Green and thence to and under the East River to Joralemon Street, Brooklyn, and thence to the present terminus of the Subway at Atlantic and Flatbush Avenues. While this work was done for the city upon a bid of $3,000,000, its cost was very much greater, and I have seen it stated that the total cost of the Brooklyn extension was in the neighborhood of $10,000,000. Just what proportion of this was spent upon the tunnel proper would require an examination of the construction company's books.

This Commission recently has awarded contracts for three new tunnels under the East River together with approaches on either side, and I can give you the total contract prices, but as none of them is near completion it is impossible to estimate what the cost of extras or additions may be. These tunnels are as follows:

For New York Municipal Railway Corporation, Whitehall Street, Manhattan, to Montague Street, Brooklyn, $5,974,809.50;

For Interborough Rapid Transit Company, Old Slip, Manhattan, to Clark Street, Brooklyn, $6,469,916.25;

For New York Municipal Railway Corporation, 14th Street, Manhattan, to North 7th Street, Brooklyn, $6,639,023.50.

The Commission has yet to award another tunnel under the East River, running from 60th Street, Manhattan, to North Jane Street, Long Island City, but bids for this work have not yet been invited.

Somewhat more complete information is available for the Steinway Tunnel, now known as the Queensboro Subway, which, under the Dual System contracts, was purchased by the city in uncompleted

about $55,000,000, and the cost of all the tunnels is sometimes given as close to $200,000,000. As these figures include a certain amount of subway construction on land as well as under water they are too high. An approximation, however, may be reached in another way. In 1914 about 60,000,000 people went through the Hudson and Manhattan tunnels; 27,000,000 of these paid seven-cent fares, and the rest five. The total passenger fares received by the Hudson and Manhattan Company amounted to $3,500,000 that year. If we make allowance for the fact that a part of this sum was paid for land transportation, the cost of passing under the river must be close to $3,000,000.

For the other tunnels no figures are available. If they necessitate as great expenditures in proportion to their capital cost as do the Hudson and Manhattan tunnels, the total for all tunnels cannot be much less than $10,000,000 each year and may be more.

With a cost of $14,500,000 for ferries, $15,530,000 for bridges, and $10,000,000 for tunnels we find that the people of New York are paying close to $40,000,000 each year to get across their water barriers. Even this, however, by no means ends the matter. Many people not only pay to go through the tunnels but pay two land fares to get home where they would pay only one if there were no water. How many such people there are we cannot even guess, but they must annually spend several million dollars that would be unnecessary if the Brooklyn and Jersey systems of transportation were a unit with those of Manhattan. It is therefore conservative to say that the people of New York are spending $40,000,000 a year to get themselves and their vehicles from one side of the rivers to the other.

Thus far we have not considered freight traffic except as it is carried by vehicles. Every pound of raw materials, food, or manufactured goods that comes to Manhattan or goes out must cross the water. Each crossing costs something. No figures are available, but the total is certainly enormous. Go out on the North or East Rivers any day and watch the train-ferries loaded with freight cars. See how they thread their way far up the East River to reach the tracks of the New York, New Haven, and Hartford Railroad. A single item will illustrate the matter. A few years ago the

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condition for $3,000,000. The owners claimed to have expended upon it $7,730,000 in excess of the $3,000.000 allowed. The city since that time has spent several hundred thousand dollars additional for construction and equipment of this line. It was opened for operation June 22, 1915, and the revenue and operating expenses for the quarter ending September 30, 1915, were:

Revenue	$22,322.00
Operating expenses and taxes	16,008.00
Maintenance of way and structure (included in operating expenses)	7,663.00

As the revenue comes almost entirely from passenger fares at five cents each, representing a one-way movement, and as an equal number of passengers are carried in the opposite direction on free transfers, the total number of passengers carried would be approximately forty times the revenue.

As to the Battery tunnel of the existing Subway, the number of passengers carried through it is indicated by the number of tickets sold at the Brooklyn stations, which was approximately 44,000,000 for the year. As this represents the westbound movement through the tunnel, it may be assumed that approximately the same traffic was carried through the eastbound tunnel.

The cost of operation and maintenance of this tunnel is not segregated in the reports. To make even an approximate segregation would require access to the operating company's payrolls and vouchers.

boat that was accustomed to carry the "Federal Express," the through train between Boston and Washington, was condemned. It was not worth while to buy a new boat, since the Hell Gate Bridge will in a few years permit the New Haven trains to cross to Long Island and there enter the Pennsylvania tunnels and so reach the Pennsylvania Station and the Jersey tunnels. Therefore the Boston-Washington trains do not now pass over the main line between New Haven and Trenton, but make a circuit northward to cross the bridge over the Hudson at Poughkeepsie. This involves a detour of 90 or 100 miles over a poor road. According to the Interstate Commerce Commission the average cost per train-mile on the New Haven road is $1.73. Hence the cost of getting one train a day each way around New York and its waters amounts to at least $120,000 per year.

Other items might be added. For instance about 20,000,000 tons of shipping pass through the Harlem River each year. The cost of opening the drawbridges for the ships has already been included in the cost of maintaining the bridges, but we have not reckoned the delays. At present the draws are open only seven hours a day, which causes not only great congestion but exasperating delays to ships. If the draws were open longer, however, the land traffic would be greatly hindered, which would be still worse. This particular matter does not enter into our calculations because it is a hindrance to water traffic and not to that by land. The question is interesting because it illustrates how land and water traffic interfere with one another.

Taking into account only the hindrances to land traffic, but including passengers, vehicles, and railroad trains, it seems safe to say that our figure of $40,000,000 per year for passengers and vehicles must be raised to $50,000,000 to include freight. In other words the water barriers of Manhattan involve an expenditure of about $10 per year for every man, woman, and child in the city. Think what it means that for an ordinary family in New York there is an outlay of fifty dollars per year simply because the coast of the eastern United States has been depressed a few feet. To be sure, this depression is what has made New York harbor, and the harbor is an enormous source of wealth to the city. An equally good harbor would have been possible, however, without separating the people of metropolitan New York into Manhattan, Long Island, New Jersey, Staten Island, and the New York mainland. One could easily plan the distribution of land and water in such a way that the accommodations for shipping would be practically as good as now, while the hindrance to land traffic would be greatly reduced.

Even yet we are not at the end of the matter. When the New Yorkers found that there was not room enough for them on the ground, they began to try to find room above and below. More than anyone else they have tried to find "a place in the sun," and they have done it by climbing upward. Sky-scrapers are such an everyday thing that people fail to realize that they

are a highly peculiar type of architecture which has developed within the last twenty-five years. Like metropolitan tunnels and huge bridges, they are a recent and novel invention. No longer ago than 1889 a nine-story office building in New York was considered remarkable, and there were none so high in any other city. Today New York alone has more than two hundred buildings over fourteen stories high, while three have at least forty stories and rise to heights of about seven hundred feet. Millions of people in the United States have never seen a hill seven hundred feet high. Perhaps the majority of New Yorkers have never seen a natural hill as high as their own highest buildings. In many parts of the country a hill as high as the Woolworth Building, 792 feet, would be called a mountain.

The evolution of the sky-scraper is the direct result of the water barriers of Manhattan. The lower end of the island is so small that it cannot accommodate half the business that would gladly go there. Hence it was natural to attempt to get more space by building higher. The Equitable Building stands upon an acre of ground but has over forty acres of floor space, thirty-eight stories above ground, and three below. New York is so large and influential that its example has carried the sky-scraper all over the country, a fact which is much to be regretted. In huge cities such as Chicago, or still more Boston, which resembles New York in being impeded by water barriers, the sky-scraper may be a necessity. Elsewhere it is usually a mistake. It commonly forms a blot on the landscape, where it rises in ugly squareness amid a host of smaller buildings, and its presence leads to congestion where no such thing is necessary. Only in New York has it become really a thing of beauty. There the number is sufficient to give the effect of a solid mass when seen from the water. Certain individual buildings are objects of high architectural beauty. In future days, when man has learned more about the art of transportation and when he no longer crowds himself into a tight corner where everyone jostles his neighbor, the world will perhaps look upon the finest sky-scrapers much as we now look upon the pyramids of Egypt,—wonderful structures, even beautiful, but not a model for the future.

The sky-scraper was originally due to the excessive value of the land in lower New York. Yet its presence has actually lowered the value in some places. The dark lower stories of sky-scrapers themselves, as well as the low buildings shaded by them, do not rent so well as they did when the new type of building was first introduced. In spite of this the rents in practically all parts of New York are excessive, and the price of land is almost fabulous. Every one who lives in the city is paying a higher rent than would be necessary if the city were built upon the mainland instead of an island. Consider what it means when a square foot of land is worth \$583. That is the highest price ever paid in New York or in the world. The next highest is \$360 in Pittsburgh, \$339.50 in London, and \$325 in Boston. The desk at which the writer is now sitting measures 32 by 50 inches, or a little over 11 square feet.

FIG. 2—The sky-scrapers of downtown New York. The development of the sky-scraper is due largely to the restricted area available because of the island-nature of the city.

If it were land in Wall Street it would be worth about $6,500. If it yielded an income of 6 per cent a piece of land the size of two such desks would support an ordinary working-man's family in more comfort than is usually the case. The average farmer in the United States has a hundred acres of land and obtains an income less than would be derived from a piece the size of two desks in New York. If he owned one hundred acres in lower New York and it were worth $250 per square foot, he would have an income of $6,000,000. Let there be no misunderstanding: the *income* from a piece of land no larger than an average farm but located around Wall Street would be about six million dollars a year.

This gives an idea of what vast sums New York is paying for rent. The mere fact that it is a large city causes the land to be enormously valuable, but in London, with more people than New York, there is no such inflation of values. The difference is due to the water barriers. How much it may be, no one can tell, but probably the extra rent due to the water barriers is even greater than the amount paid for transportation across them. If this is so, the fact that Manhattan is an island costs the average family in New York at least $100 a year, and possibly more. Only an extremely rich city could stand such a strain.

It might seem as if at last we had reached the end of the indictment of the water barriers. But there is one more phase of the matter. The congestion in lower New York is tremendous. Every day over 750,000 people swarm into the region below 23rd Street by subway, tube, bridge, and ferry, and still others by surface cars and on foot. Such crowding has a bad effect on both health and character. When 15,000 people pour out of a single building in an hour, and when hundreds of thousands pour from other buildings within a space of a few hundred acres, the congestion is enormous. Go down to a subway station between five and six o'clock at night, when the working day is over, and see how the people crowd and jam; go to an elevated station and watch them push for places. Watch them hang from the straps in the cars; watch the interminable line of cars across Brooklyn Bridge. Consider how many people have been rudely crowded and shoved during that one hour; how many tired girls are standing when they ought to be sitting; how many are roughly pushed until they almost fall. How many people of every kind have suffered a nervous shock because of the daily rush; how many have taken cold or become sick, because they have been overtired and have breathed polluted air while wearily hanging to a strap and swinging and jolting from side to side. Because of such conditions how many are today less efficient than they might have been? How many have yielded to temptation in one form or another simply because the nervous wear and tear of the terrible congestion of lower New York have decreased their vitality? All these are things that we must take into account if we would know what the water barriers are doing to the great American metropolis.

In one sense such congestion is found in every city, but because New York is on an island it is greatly exaggerated there. As we look at the effect of New York's water barriers on the cost of living, on architecture, on rents, on problems of transportation, on health, on morals, can we say that man has overcome his physical environment? By our attempts to overcome it, have we not made ourselves a hundred times more subject to it? In the old days of New York when there were 30,000 people, did a single one ever lose his health or suffer nervous breakdown because the water barriers added to the strain of life? A small part of the population was put to extra expense when they traveled, and all had to pay a little more for food because it had to be brought across the rivers. That was the total effect. Today there is not a person in the city who is not directly and deeply influenced by the ferries, bridges, and tunnels, by the high rents, or by the congestion and crowding. The toll now taken by the water barriers is measured in hundreds of millions of dollars and thousands of human characters each year. We may have conquered nature, but in the struggle she has bound us as tightly as we have bound her.

If we would realize how completely modern man is under the influence of his physical surroundings, consider how much more harm a convulsion of nature would do now than ever before. Suppose an earthquake no worse than hundreds that have occurred in other places should shake down New York's bridges and ferry terminals and should open cracks by which the water could flow into the tunnels. What would happen to the city? The starvation, misery, and death that would follow can scarcely be pictured. Hundreds of thousands, if not millions of people would no longer be able to carry on their daily work or procure food.

It is true that such a calamity is not likely to happen because New York is not in a region subject to earthquakes. There is another and much worse calamity, however, which is more likely to overtake us. The nations that were great two thousand or more years ago have all fallen to a low estate with the single exception of Italy, and it has had its Dark Ages. Take Mesopotamia as an example. Because the people neglected their canals or lost the skill and energy to care for them or because they could not ward off enemies, the Euphrates and Tigris Rivers broke loose, the canals were ruined, and the Garden of Eden became no better than a desert. The people of Mesopotamia had conquered nature to a far larger extent than had the Arabs to the south of them or the Kurds to the north. Hence when they lost control their fall was correspondingly great. In their day of power they thought that their dominion would last forever. They failed to discover the causes that were undermining their strength, and their civilization perished from the face of the earth.

Today we are in our hour of greatness. What will happen to us tomorrow? Suppose that luxury, vice, self-seeking, disregard for high ideals, and all the other evils of a decadent nation come upon us. The seeds are

here. What if they should grow? Then our control of nature would be lost. Our bridges, poorly repaired by corrupt and inefficient spoilsmen, would fall; our tunnels would begin to leak; our great buildings would one by one collapse. These things could easily happen in a few centuries if once our grip on nature and on ourselves should relax. The only way that we can permanently retain the mastery of nature is by building up human character. Formerly men thought that religion, education, and training were the chief means to this end. In recent generations we have learned that proper food, clothing and houses, abundant fresh air, and freedom from disease also play a highly important rôle in the process. Today we are at last coming to a realization that only by weeding out the weak-bodied, weak-willed parts of the community through some form of eugenic selection, and by seeing that people are adjusted to their physical environment, can we provide proper human material for the great tasks of civilization. We can scarcely avoid the conclusion that the building up of character is as much the work of the scientist as of the preacher, teacher, or philanthropist. Our dependence upon nature, as is shown by the water barriers of New York, is increasing by leaps and bounds. In spite of the constantly growing price that he must pay, man is still master. His mastery, however, depends upon the preservation of his energy, vigilance, industry, inventiveness, honesty, and other high traits of character. Our constantly growing dependence upon nature makes it more necessary than ever before that science should play its part in preserving those traits which alone can render man permanently victorious over his geographical environment.[3]

[3] For a valuable discussion of City crowding and the interrelations of offices, residences, slums, and factories see the section on congestion in "The Cost of Competition" by S. A. Reeve, Doubleday, Page & Co., Garden City, N. Y., 1906, pp. 285-293.

SOME GEOGRAPHIC PROBLEMS INCIDENT TO THE GROWTH OF NEW YORK CITY*

By E. P. GOODRICH
Consulting Engineer

Among the items which a municipal engineer meets in his professional work and which are related to geography are the making of maps of differ-

FIG. 1—Map of New York City prepared in 1900 for exhibition at the Paris Exposition. The scale of the original is 1,800 feet to 1 inch, or 1:21,600; there is also an edition on half the scale, 1:43,200. Its special value lies in its representation of relief (in contours) and the built-up area.

ent kinds such as those which show the streets, waterways, and railroads, and the distribution of population and of traffic, both present and prospec-

* Read at the third joint meeting of the Association of American Geographers and the American Geographical Society, April 14 and 15, 1916.

tive; the computation of population data and related demographic phenomena and their reduction to diagrammatic form, such as population curves, past and future; the preparation of street railroad passenger diagrams, train operation diagrams, the water consumption curve, past and future, and traffic congestion diagrams; together with the collection and analysis of the data necessary to a proper study of each subject.

FIG. 2—The official map of New York City published in 1915. The scale of the original is 2,000 feet to 1 inch, or 1:24,000. This map shows the theoretical street system. Only a relatively small proportion of the streets shown are physically open in most of the boroughs.

An interesting example of cartography is found in the 1900 map of New York City (Fig. 1) prepared by the Topographical Bureau of the Board of Public Improvements, Mr. Louis A. Risse, Chief Topographical Engineer, for exhibition at the Paris Exposition. Although it is marred by a more or less imaginary treatment of proposed streets and parks in the outlying dis-

FIG. 3—Photograph of a relief model of New York City and vicinity. A study of this model in comparison with Figure 2 shows the present development in contradistinction to the theoretical street system. The model also shows how topographical features have guided and limited this development. (Courtesy of Howell's Microcosm.)

tricts, the map is of great value to the geographer because it represents relief (by contours) and the built-up area—elements rarely available on a city map and the latter generally only on detailed insurance atlases.

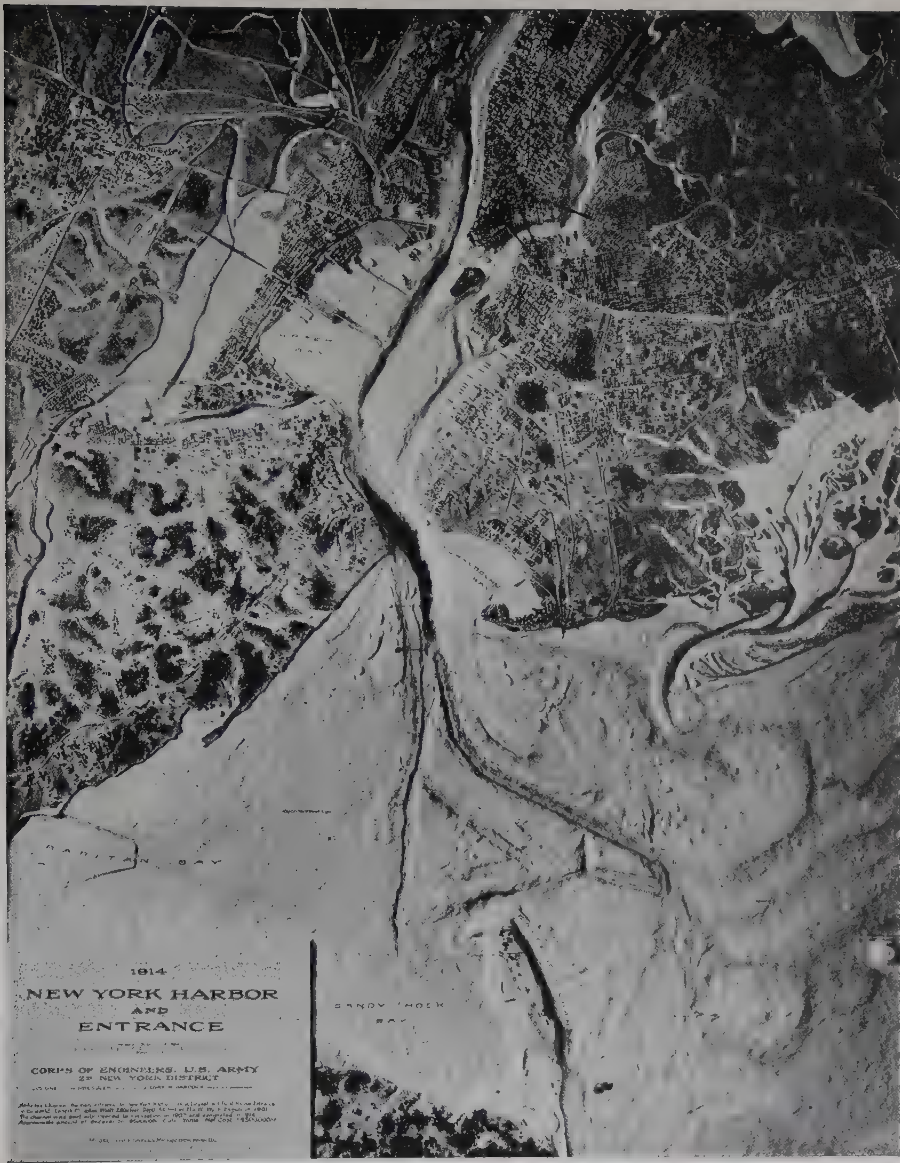

FIG. 4—Photograph of a relief model of the submarine topography of New York Harbor. It shows the artificial channels dredged to give entrance to New York Bay, and how and where the natural channels exist.

The 1915 map of New York City (Fig. 2), prepared by the Bureau of Public Works of the Board of Estimate and Apportionment, Mr. Nelson P.

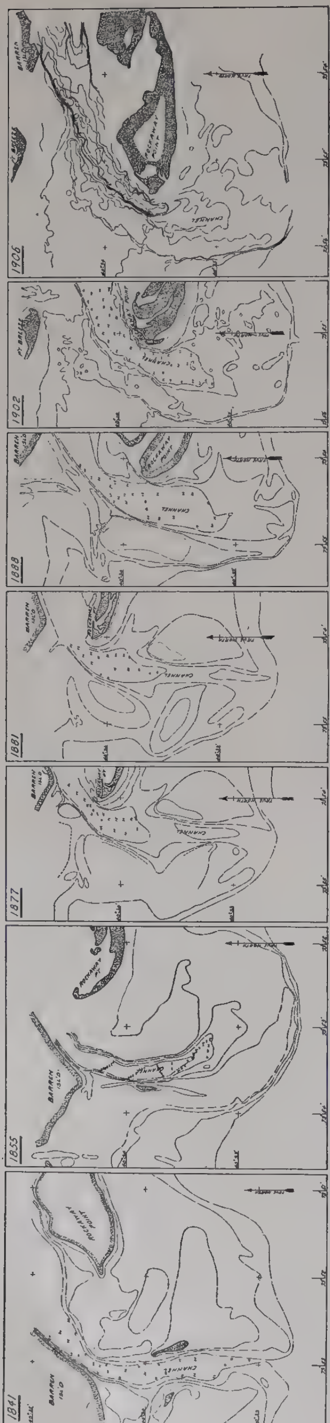

FIG. 5—Maps of the entrance to Jamaica Bay from 1841 to 1906, from "Report of the Jamaica Bay Improvement Commission," *House of Repr., 60th Congr., 2d Sess., Doc. 1506*, Washington, 1909. A comparison of these maps, one with another, will show how the point at the entrance has moved progressively westward due to the drift of the beach sand.

Lewis, Chief Engineer, is a map which complies with the requirements of the City Charter in showing all streets whether actually paved, or only graded, or only staked out on the ground so lots can be sold, or only projected by the land owners and about which proper formalities have been complied with in the way of signing certain documents. In most of the outlying districts a traveler could negotiate the majority of the streets shown only on foot. The map was made after long and laborious triangulations and traverses, and a most carefully referenced system of co-ordinates has been established with monuments properly located in the field, all with an accuracy of at least 1 in 100,000.

A comparison of that map with a photograph of Howell's relief model (Fig. 3) will show at the same time the deficiencies inhering in a legal city map. On the model only those streets have been indicated which physically exist, together with a representation of the surface topography. A map of this kind is specially serviceable in studying problems of transportation, sewerage, population distribution, etc., because it shows in a comprehensive way the barriers to traffic and population growth, such as the ridges and valleys which alternate parallel with the Hudson River in the northern part of the city.

A model of a similar kind, which shows the underwater topography of New York Harbor (Fig. 4) is also of interest. It shows the submarine river channels, among other things, and also the effect which human effort has had in modifying natural causes in connection with the new direct artificial

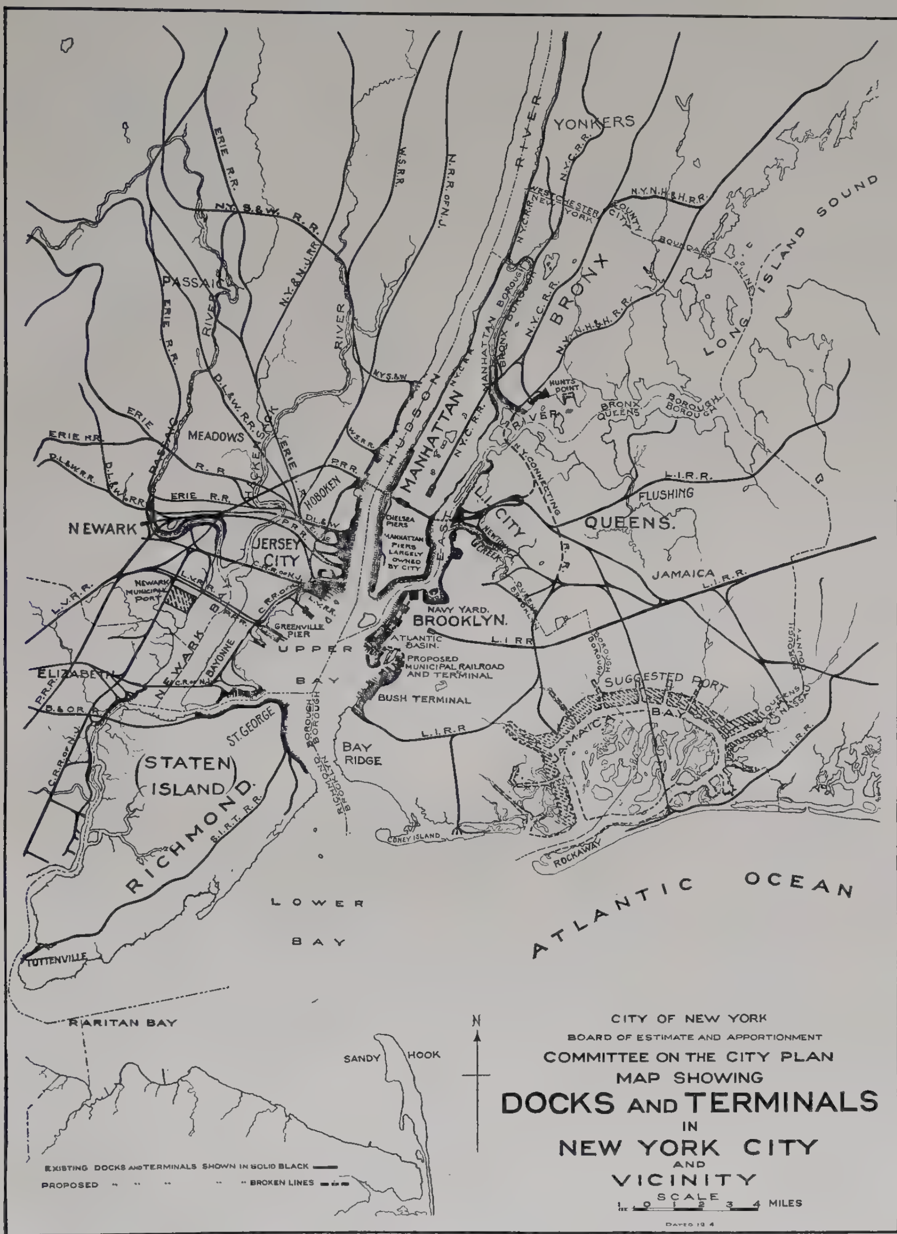

FIG. 6—Map showing existing and proposed docks and terminals in New York City. A comparison of this map with Figure 3 will indicate where it is impossible to develop more docks because of topographical limitations. (Courtesy of the Committee on the City Plan of the City of New York.)

FIG. 7—Balloon photograph of the major portion of the Bush Terminal, Brooklyn (for location, see Fig. 6), showing the piers one-quarter of a mile long in the foreground, warehouses in the right background, and the tenant factory buildings in the left background. (Courtesy of the Bush Terminal Co.)

FIG. 8—Balloon photograph of a portion of the Bush Terminal showing the railroad yard in the center, concrete and brick multi-storied warehouses for miscellaneous merchandise on the left, one-storied warehouses for fibers (cotton, jute, sisal, etc.) in the right foreground, and the tenant factory buildings in the right background. (Courtesy of the Bush Terminal Co.)

channel between the inner harbor and the ocean. The fact that this artificial channel has apparently become self-sustaining will be watched with interest by harbor engineers and studied in connection with the phenomena of shore erosion and shift of channel which has evidently continued for centuries

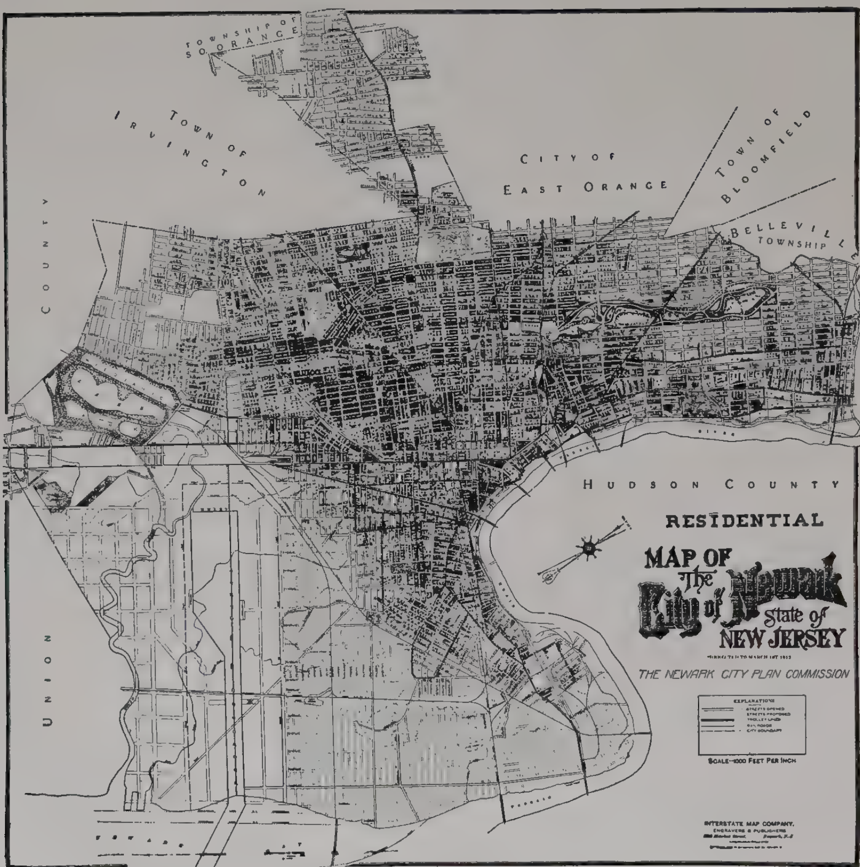

FIG. 9—Map of Newark, N. J., showing the distribution of population. The distribution of the residential population as given on the insurance maps is indicated graphically by dots. Each dot represents 25 people. The congested sections are shown very clearly by the density of the dots. Note the room for expansion to the north, south, and west, where dots are less numerous. (Courtesy of the Newark City Plan Commission.)

and which is now in process at the mouth of Jamaica Bay, for example (see Fig. 5).

A harbor map which shows the present development (such as Fig. 6), when compared with a topographical relief map, indicates what a relatively small portion of New York City's waterfront has been actually and efficiently developed, and what a considerable extent is impossible of easy improvement for commercial use because of topographical features. There is in reality very small reason for the congestion which now exists on the west

side of Manhattan Island, along the waterfront of the Hudson River. This phenomenon seems to be one caused rather by habit and sentiment than by the laws of economics.

Should this question of economics be carefully analyzed it would doubtless show how the Bush Terminal (Figs. 7 and 8) has been able to build up what

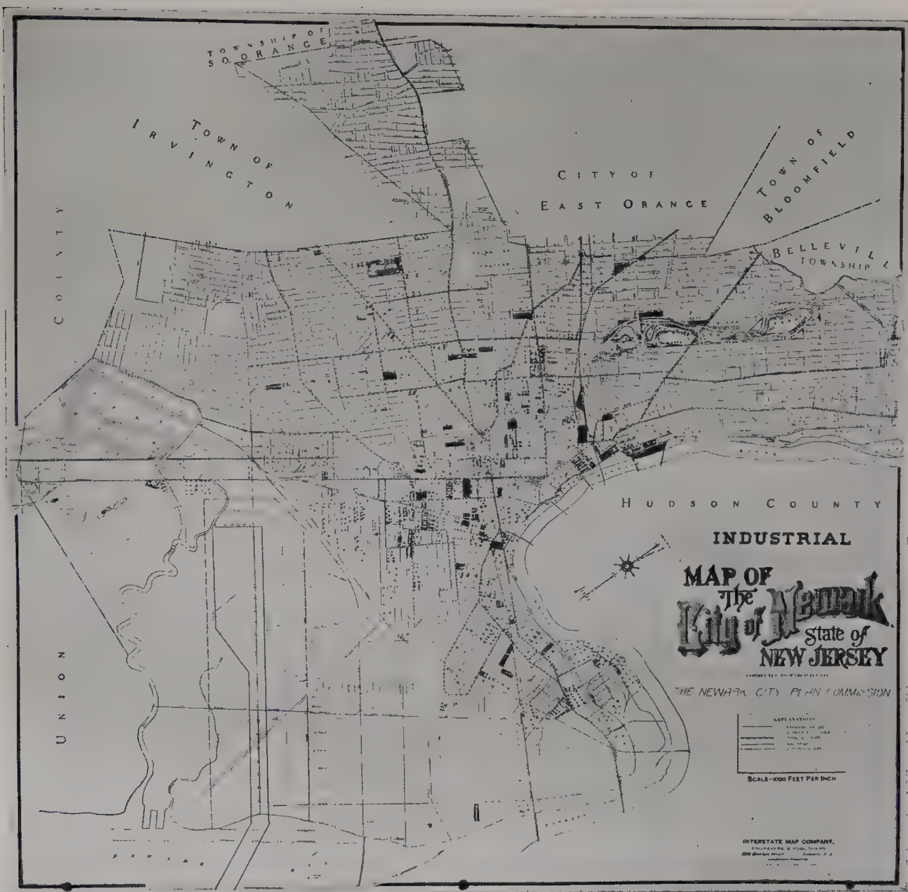

Fig. 10—Map of Newark, N. J., by the City Plan Commission, showing the location of factories and, by dots, the relative number of workers with their daily distribution. (Courtesy of the Newark City Plan Commission.)

has been considered by many as the most perfect waterfront terminal in the world. Such a study would take into consideration population distribution, distribution of manufactures, passenger transportation, street traffic facilities, etc. Studies of each of these varieties have been made, as illustrated upon the population and factory maps of Newark (Figs. 9 and 10), prepared by its City Plan Commission; the present and projected rapid-transit system map of New York (Fig. 11), the time-zone map of New York, which

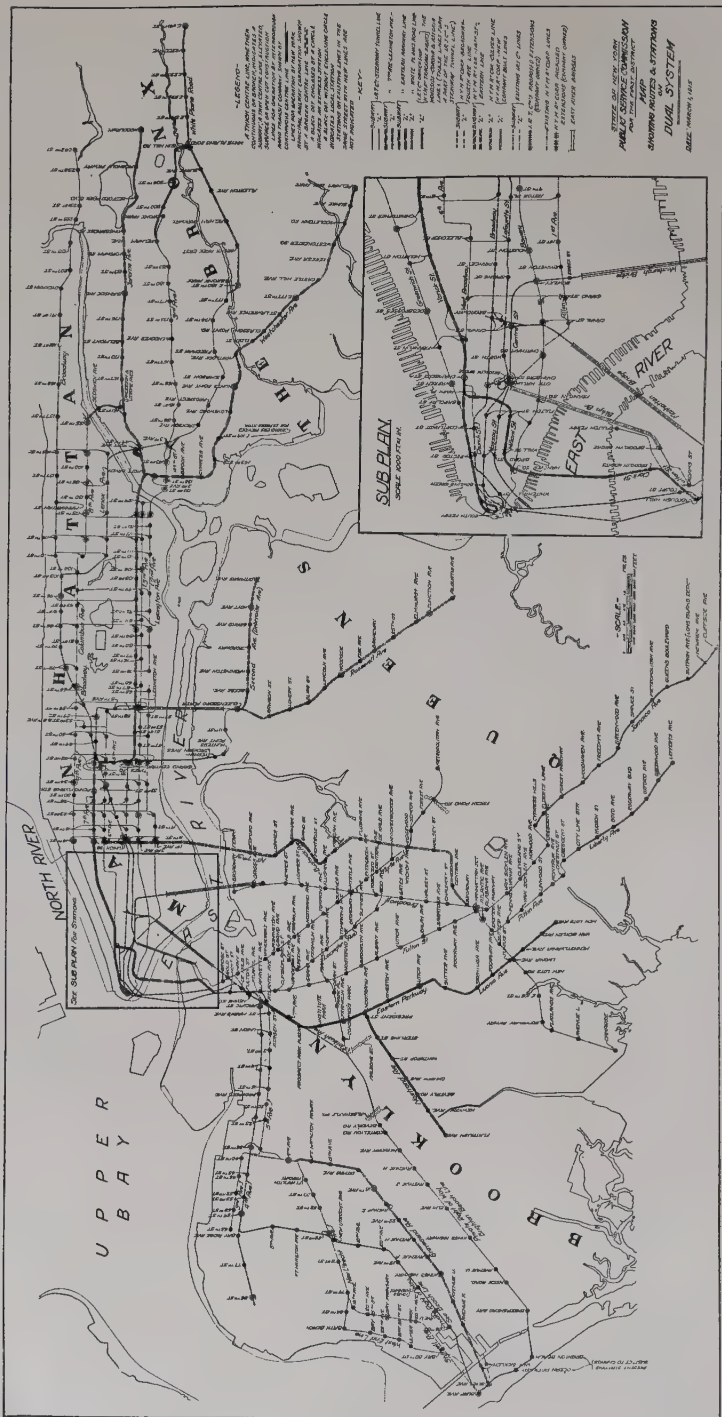

FIG. 11—Map by the Public Service Commission showing routes and stations on the municipal rapid transit lines of New York City. The scale of the original is 1:28,000; of this reduction, 1:200,000. (Courtesy of the Public Service Commission for the First District.)

indicates the minimum time in which all points in the city within a five-cent fare limit can be reached by the rapid-transit system (exists only as a manuscript drawing and is too complicated to reproduce here); the trolley traffic distribution map of the city of Newark (Fig. 12), etc. The time-zone map was prepared by the City Plan Commission of New York City,

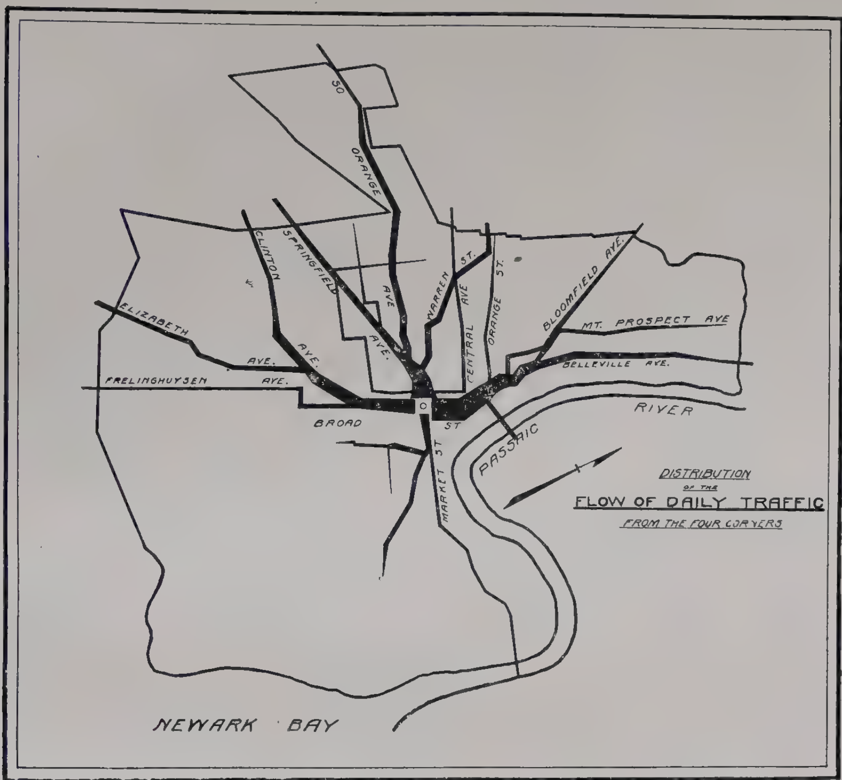

Fig. 12—A diagram representing the total number of passengers carried past various points in Newark, N.J., during a full day. Approximately 200,000 people enter and leave the "Four Corners" upon the trolley cars, each day, from 7 A.M. to 7 P.M. The greatest proportion of this travel is north and west as shown by the width of the bands in the diagram. These illustrate the proportion of travel upon each of the various routes. Note the great radial thoroughfares, the lack of cross-town lines, and the peculiar centralization at the "Four Corners." (Courtesy of the Newark City Plan Commission.)

which, in association with the Heights of Buildings Commission and the Commission on Building Districts and Restrictions (which three commissions are largely identical), has also studied the matters indicated by their names and are now presenting to the public and the authorities the results of their deliberations. The maps of Brooklyn indicating building-height limits (Fig. 13), limits of per cent of area which may be occupied by buildings (Fig. 14), and zones within which manufacturing and business and residences may be located (Fig. 15) are typical of those for the rest

of the city and, all taken together, if adopted[1], may so restrict population conditions as seriously to modify what may be called natural exigencies. Possibly housing congestion will be reduced, street traffic congestion controlled, street accidents minimized, real estate values stabilized, etc.

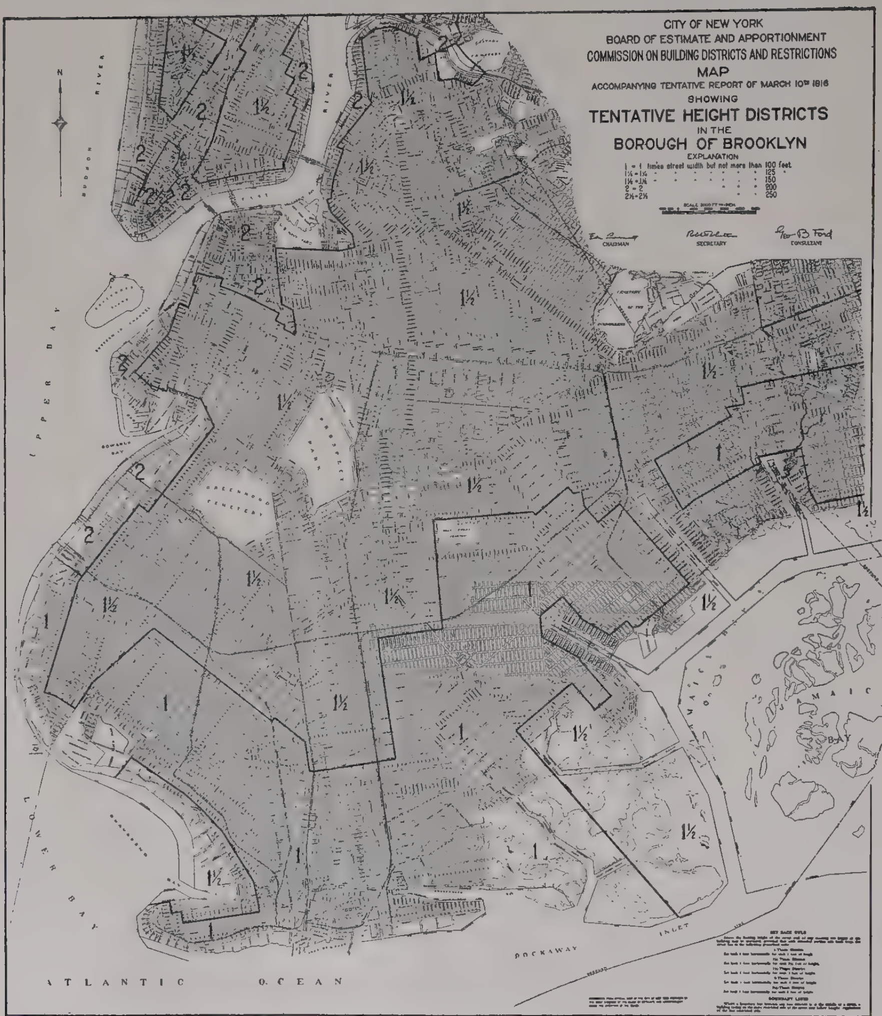

FIG. 13—A map of the Borough of Brooklyn showing proposed district of height-of-building restrictions. In the districts marked 1 buildings may be as high as the street is wide, but not more than 100 feet high; in the districts marked 1½ the height of buildings may be one and a half times the width of the street, but not more than 150 feet, etc. (Courtesy of the Commission on Building Districts and Restrictions.)

Closely related to maps are diagrams designed to represent combined geographical and other data. A "flow" diagram such as that of the "Four Corners" of Newark (Fig. 16) is fully as much a map as that of street

[1] Since this paper was read the zone maps have been legally adopted.

traffic already mentioned. The facts revealed by this diagram led to the promulgation of a police traffic rule prohibiting all left-hand turns. This prohibition resulted in an increased speed of traffic over the street intersection much more than proportional to the number of vehicles eliminated.

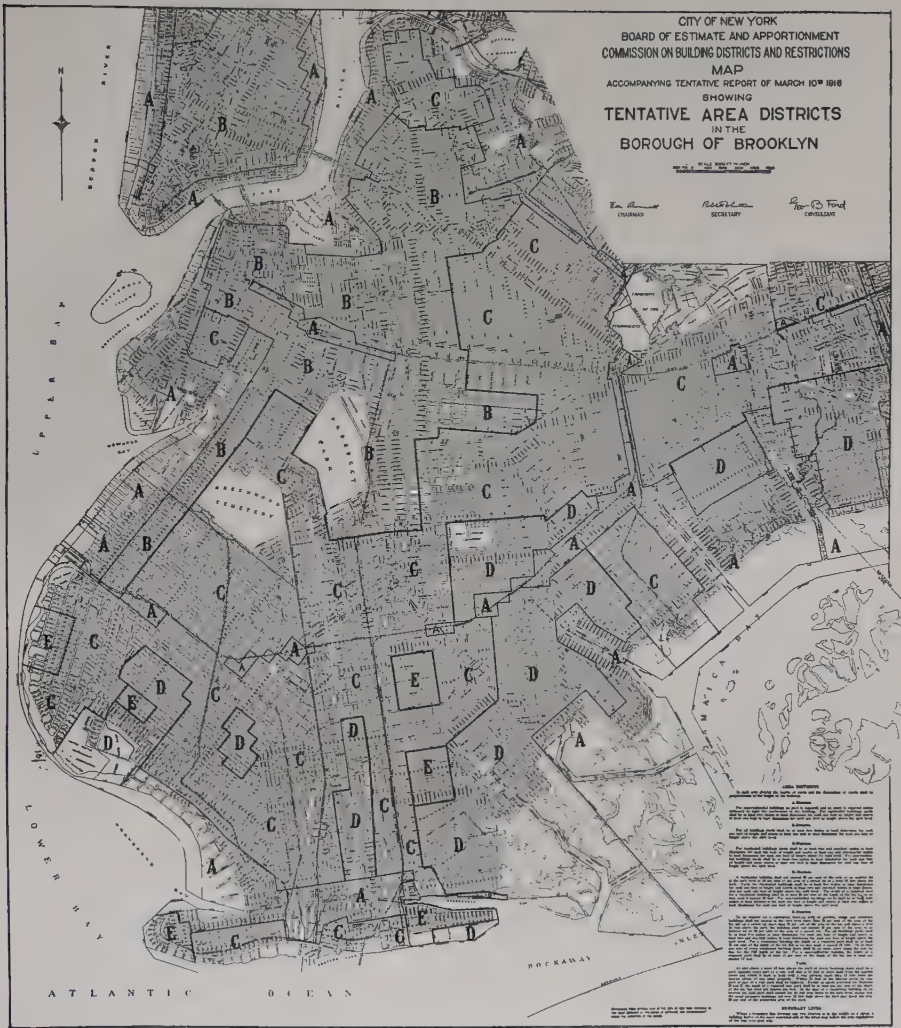

FIG. 14—A map of the Borough of Brooklyn showing proposed districts according to the proportion of the lot which may be occupied by the building on it. The area that may be covered by buildings decreases from the districts marked A, which are to be preserved mainly for business and manufacturing, to those marked E, which are to be kept for detached residences. (Courtesy of the Commission on Building Districts and Restrictions.)

The typical street-car riding diagrams of the same community (Figs. 17 and 18) visualize conditions along the full length of and at a designated spot on a certain street during each hour of the day, approximately, and are of material assistance in studying the daily movements of population. Another

diagram of somewhat similar kind shows the loading of trains on one of the New York Elevated lines as they passed a given station (Fig. 19). This diagram was constructed to show the state of congestion on the road and whether or not it was possible to divert the passengers from another route

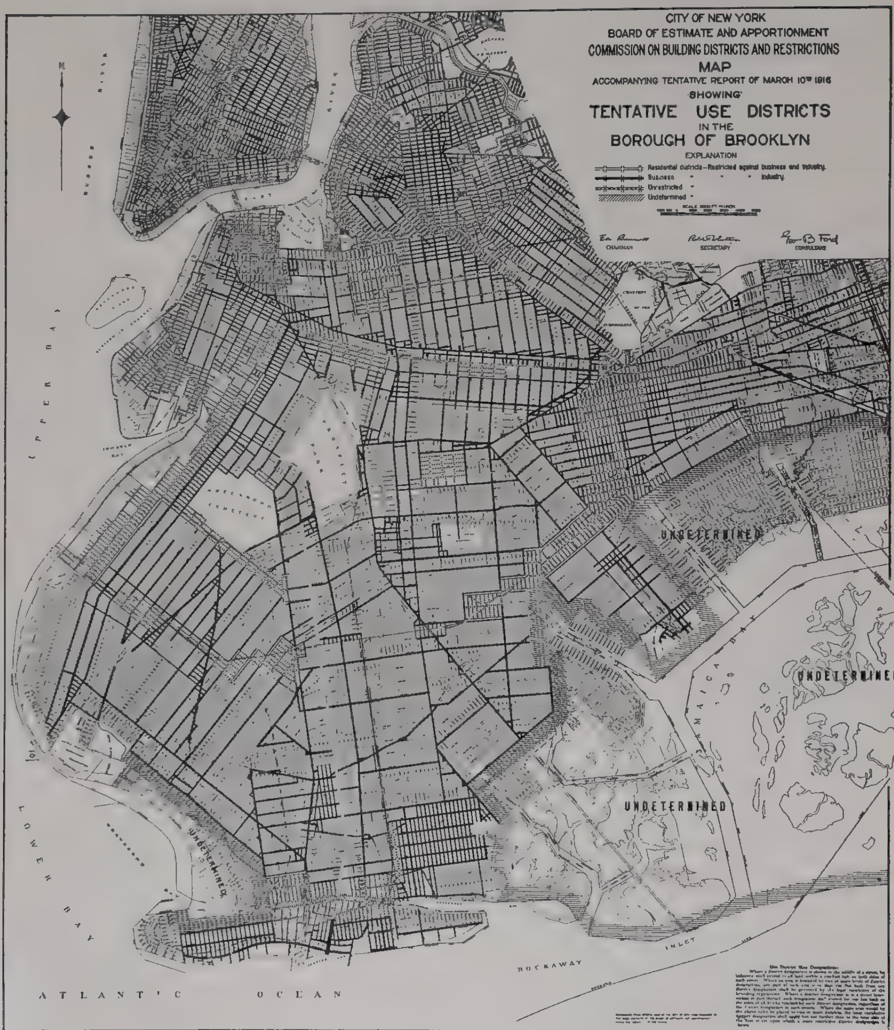

FIG. 15—A map of the Borough of Brooklyn showing proposed restrictions on the use to which the streets are to be put according to the buildings fronting on them. Streets marked with a double hair-line are to be residential and restricted against business and industry; streets in heavy black are business streets to be restricted against manufacturing; streets in mottled design are unrestricted. The hatched areas bordering Jamaica and Gravesend Bays are also unrestricted. (Courtesy of the Commission on Building Districts and Restrictions.)

on to the trains of that line. It may be of interest to note that no one of the trains was loaded to the limit which has been set by the Board of Health as the maximum number of persons which should be allowed in a trolley car.

Still another diagram showing pedestrian traffic conditions on Nassau Street in Manhattan (Fig. 20) has been used to determine the numerical figure for the number of persons using a sidewalk per foot of width, per minute, at which the walk may be considered as congested. The figure measuring the number of persons on each sidewalk during the fifteen-minute period just preceding the one in which the roadway was jammed

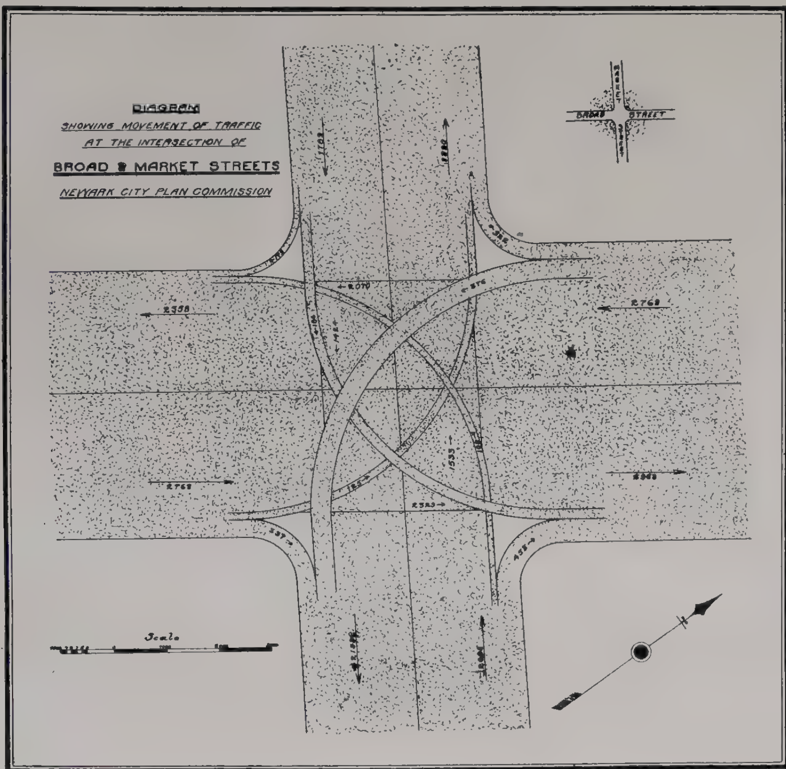

FIG. 16—A diagram showing the travel in each direction and on each turn at the principal intersection in Newark, N. J. The width of each band represents the proportion of travel in each of the various directions indicated by the arrows. The numbers show vehicles and cars which make this crossing each day, from 8 A.M. to 6 P.M. Note the small proportion of vehicles making left-hand turns. Since this study was made all left-hand turns have been prohibited at this point. (Courtesy of the Newark City Plan Commission.)

so strikingly (i. e. 11.45 A. M. to 12 M., with about 800 persons on each sidewalk and about 425 pedestrians in the roadway) is believed to represent with fair accuracy what may be termed a condition of congestion.

Some interest may also be found in the method used of ascertaining the average velocity of travel on Fifth Avenue across 34th Street by the device of identifying and numbering all the vehicles caught in a series of photographs taken every thirty seconds (see Figs. 21, 22, 23, and 24). The density is determined by averaging the total number of vehicles found in a block

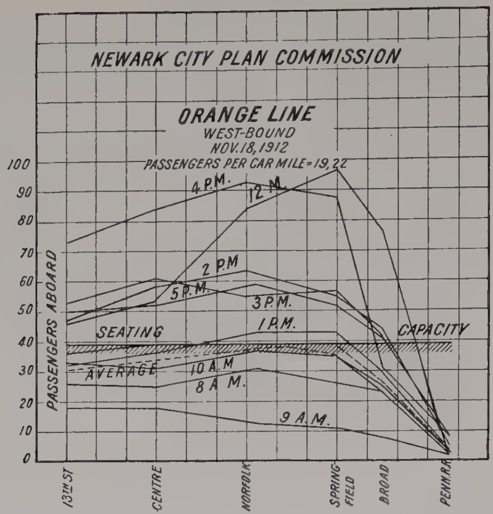

FIG. 17—A diagram showing the number of passengers on board a given car throughout a full typical trip, hour by hour, throughout the day of a Newark, N. J., street-car line. The number of passengers aboard at each point on the route is shown by the vertical scale. The hatched line represents the average seating capacity of each car. All curves above the seating capacity line represent standing passengers. Note the large number of standing passengers throughout very nearly the entire afternoon. This is one of the most congested lines in the city. Figures used in plotting this chart were obtained by men riding on the cars, a record of entering and leaving passengers being made at each stop.

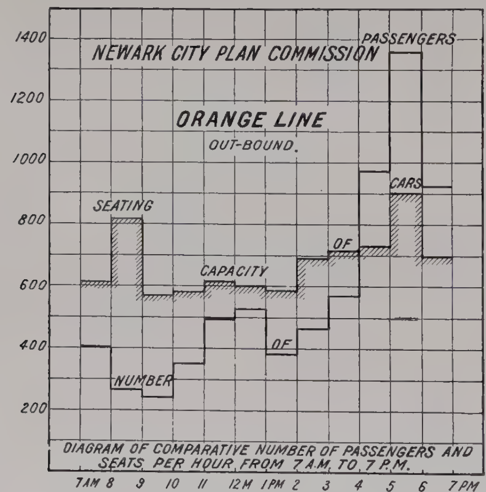

FIG. 18—A diagram illustrating supply and demand. The hatched line represents the total number of seats available each hour throughout the day, west-bound, on a Newark, N. J., street-car line. The full line represents the total number of passengers using this line, hour by hour, throughout the day. Note the excessive seat supply in the morning rush hour and the corresponding lack of seats in the evening rush hour. The irregularity of the flow of travel is well illustrated by the line of total passengers, and, by this, one can obtain a vague idea of the problem which faces the operating company in regulating the supply to meet the demand. Charts similar to this were made for each line operating in the city.

length in the several pictures. The total number passing is determined by the count. These two factors make a computation of the average velocity an easy matter.

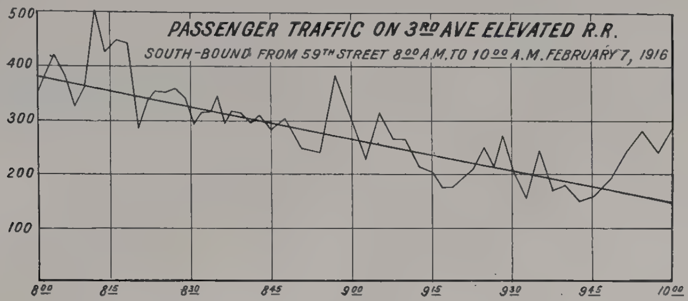

FIG. 19—A diagram showing the loading of trains on a New York Elevated line as they pass a given station. The figures on the left denote the number of passengers, those at the bottom the time from 8.00 to 10.00 A.M. Note the diminishing loading on every third train (approximately) and the diminishing loading as time passes during the morning rush hour.

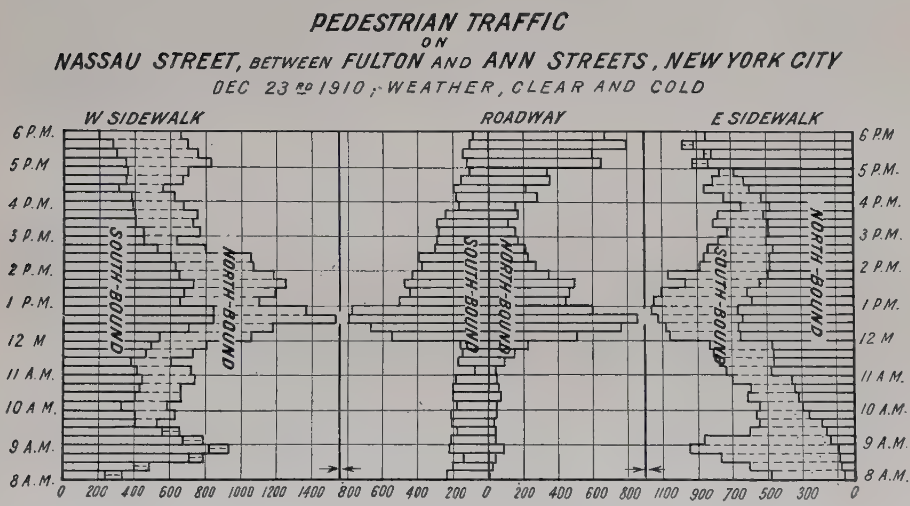

FIG. 20—A diagram showing the distribution of pedestrian traffic on Nassau Street, Borough of Manhattan, illustrating method of determining maximum convenient sidewalk traffic density. The figures at the bottom denote the number of pedestrians, there being a scale for each sidewalk and two for the roadway, increasing in the sense indicated by the arrow heads. The strips in the central section of the diagram indicate the overflow from the sidewalks. Note that at no time during business hours is the roadway free from pedestrians.

A natural line of inquiry growing out of street-traffic congestion studies is as to the future probabilities of the amount of street use. This query throws one instantly upon future population studies, in connection with which some diagrams of census statistics and their use in the realm of prophecy may be worthy of examination. The experience of Greater London (see Fig. 25) as to uniformity of growth would lead one to feel that he could prophesy

Fig. 22.

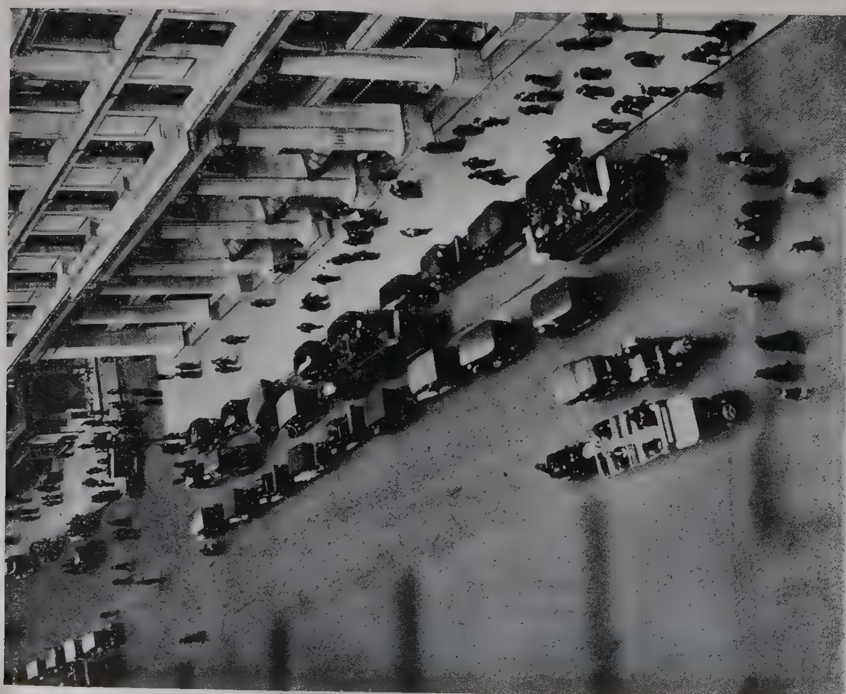

Fig. 21.

FIG. 23.

FIG. 24.

FIGS. 21-24—Four photographs, taken from the top of a building, of traffic on Fifth Avenue just north of 34th Street, Borough of Manhattan, showing vehicular traffic conditions and how it is possible to count the number of vehicles through a comparison of photographs taken thirty seconds apart, thus making possible estimates of vehicle density and average velocity. The photographs are in pairs, Figures 21 and 22 and Figures 23 and 24 belonging together. The same vehicles may be identified in each pair of photographs. Thus, the open automobile, the fifth of the inner row on the far side of the street in Figure 21, has progressed to the street-corner in Figure 22 during the thirty seconds elapsed, while the horse truck in the lower right-hand corner of Figure 23 has progressed four-fifths of the length of block, as shown in Figure 24.

with a fair degree of probability as to future censuses. Prophecy as to the future of New York City and especially of its smaller subdivisions is much more difficult. The estimates for the Borough of Manhattan (see Fig. 26) were based on a careful survey of all lands not now occupied with buildings and of the numbers of low buildings which may be replaced by higher ones so as to house more persons.

Intimately related to future population estimates are the corresponding ones as to the probable uses of telephones, of transit facilities, of the total

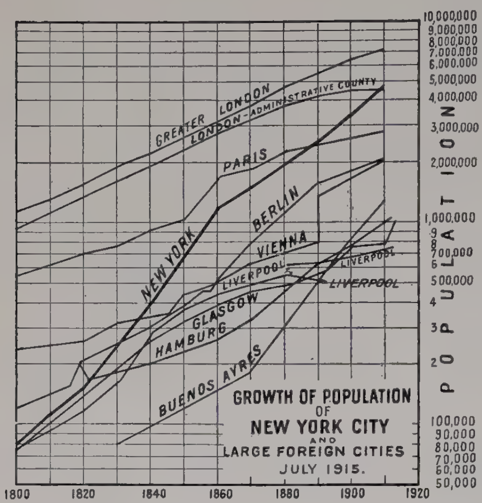

FIG. 25—A diagram of the growth of population of New York and large foreign cities. The relative uniformity of increase in many cases affords a fairly reliable basis for estimates of future population.

Figures 25 and 26 should be compared with the diagrams in Mark Jefferson's "How American Cities Grow," *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, pp. 19-37. The growth curves there, it should be borne in mind, however, often refer to the geographic and not the administrative city and are drawn on cross-section paper with co-ordinates of uniform intervals, while the present two diagrams are drawn with abscissas whose interval increasingly diminishes, a condition which tends to compress the growth curves.

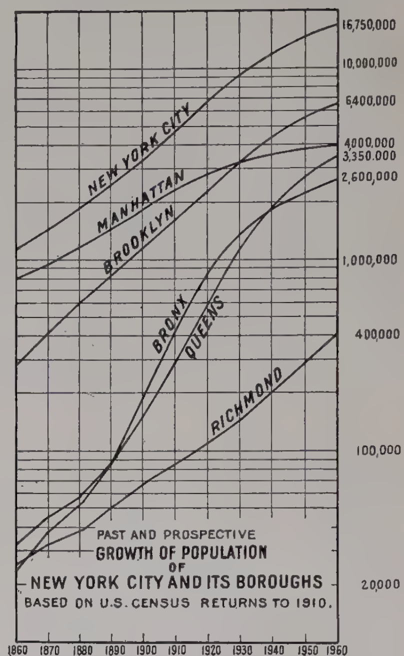

FIG. 26—A diagram of the growth of population of New York City and its boroughs since 1860, and estimates of future population to cover a century.

consumption of water, etc. (Studies of this nature have been made by the telephone company, those who laid out the present rapid-transit system, etc.) A diagram prepared by the Bureau of Contract Supervision of the Board of Estimate and Apportionment of New York City (Fig. 27) illustrates a line of study employed to determine the latest date at which new sources of water supply must be provided to meet indicated needs.

This rapid survey will suggest, it is hoped, the frequent points of contact in the work of the geographer and the municipal engineer. Both often have recourse to the same methods, the one in recording and interpreting,

the other in guiding the development of that most complex and concentrated unit of human geography, the city.

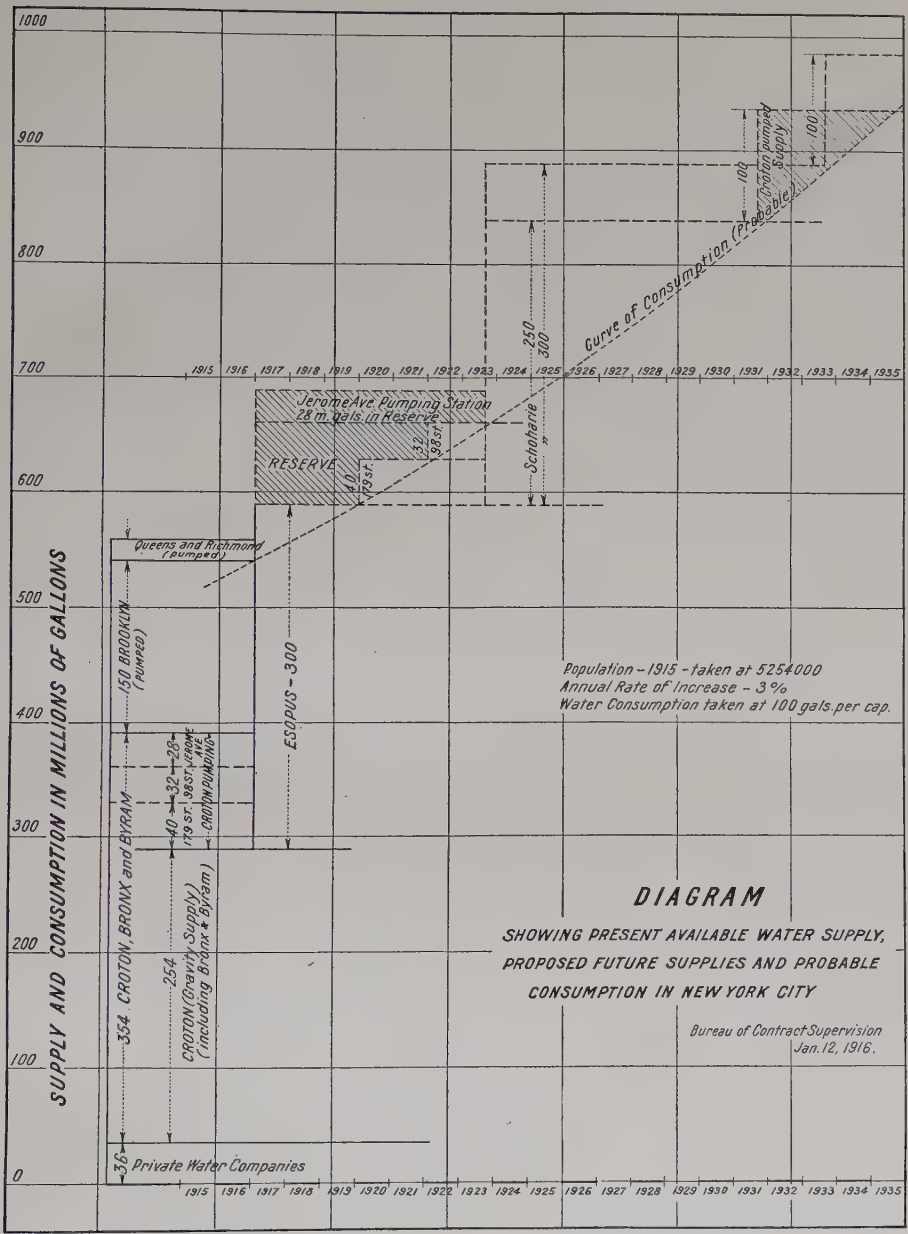

FIG. 27—A diagram showing the method of estimating future requirements for water supply based on probable curve of consumption and known sources of supply which can be made available from time to time. On the basis of this diagram estimates can be made as to the dates upon which a start must be made in developing new sources of supply, etc. (Copied from a diagram by the Bureau of Contract Supervision, Board of Estimate and Apportionment.)

THE POPULATION OF NEW YORK STATE*

By ALBERT PERRY BRIGHAM

In 1798 an obscure clergyman in a country parish in England wrote an unsigned book which brought him into the light and gave him fame. The author was Malthus, the book was the "Essay on the Principle of Population," and the object was the "future improvement of society." Eight years before the curate wrote his essay, the United States had set the world its first example of a complete enumeration of the people without reference to special ends. The pattern thus set, the nineteenth century saw the unfolding of the census among all civilized people.

In 1810, in our own country, questions were asked about manufactures and in 1840 the farm was included. In later years the mines and fisheries were taken in, and a wide variety of economic and social queries. Now bulky volumes packed with data come from presses whose work is never done.

All this implies the deepening intimacy of man with the earth. What people are, where they came from, how long they have been there, with what measure of power they use the forces and fruits of nature,—these are questions to be answered, and they belong jointly to geography, to social and industrial science, to race and to history. What fullness of meaning there is in the distribution of people was recognized by one of our foremost economists.[1] "The widest and most controlling condition of our status on earth is the ratio of our numbers to the land at our disposal. . . . . . From one point of view history may be regarded as showing the fluctuations in the ratio of the population to the land."

The distribution of population may be said to involve the whole of human geography. Whether in a region the density be one or a thousand, there are reasons for it. To know these reasons we must open the whole field of reaction between man and his environment.

At the last federal enumeration New York had a population density of 191. This fact standing alone means little, but the view widens when we compare Illinois, with her richer fields, facile transportation, and her density of 101; or when we see that no state beyond the Mississippi River averaged half a hundred to the square mile.

All Canada holds fewer human occupants by millions than the Empire State. It is no simple question of latitude, soil, and climate, as witness the natural riches of Nova Scotia, Ontario, Manitoba, British Columbia, or the Yukon. Nor does geography, unaided by sister sciences, tell us why

* Read at the third joint meeting of the Association of American Geographers and the American Geographical Society, April 14 and 15, 1916.

[1] W. G. Sumner: Earth Hunger and Other Essays, pp. 32, 37.

New York in the last census decennium added more people to her number than the entire population of Mississippi, Kansas, Louisiana, or South Carolina.

We may take all of the states of New England except Maine, throw in New Jersey and Delaware and find remaining in New York enough land to equal three-fourths of Massachusetts. By eastern standards, New York with her 47,000 square miles is large. But there are in the Union twenty-eight larger states. It would require more than two New Yorks to cover Colorado, Arizona, or Nevada, more than three to be equal to California and more than five to match Texas. By western standards the Empire State is small. She recovers her dignity, however, if she looks across the sea and finds that she is nearly as large as England and about equals the combined area of the Netherlands, Denmark, Switzerland, and Montenegro.

The population of New York in 1910 was 9,133,614 and the density was 191. In 1915 the population had risen to 9,678,744, and the density was 203. In five years each average square mile had gained twelve new inhabitants, more than the total density of eleven of our states in 1910. In that year ten states showed a density exceeding 100. Of these, three are in New England, three in the Middle Atlantic group, two, Maryland and Delaware, are South Atlantic states, and two, Ohio and Illinois, are in the North-Central region. We need no further evidence to show how heavily the northeast balances the rest of the country and to explain why for decades the center of population has been making a dilatory movement across the state of Indiana.

In 1915 New York assumed rank, with three New England states and New Jersey, among the five that have passed the two hundred mark. In this connection the following comparison of densities is not without interest:

Italy	1914	321
Austria	1910	247
Hungary	1910	166
Austria-Hungary	1910	204
New York	1915	203

Recurring now for purposes of comparison to the figures of the Thirteenth Census, New York need not fear her showing with southern New England. We will assume an area in southeastern New York that is about equivalent to Massachusetts (Fig. 1). It will include all of Long Island, all of the City of New York, the Hudson River counties as far north as Albany and Rensselaer, and Orange County, in all seventeen counties. Here is a territory slightly larger than Massachusetts, having a density of 697, while the figure for the New England state is 418.

If, as shown in the map, we push toward central New York and cover eight additional counties, we shall include areas slightly greater than the combined surfaces of Massachusetts, Rhode Island, and Connecticut. The density in the selected part of New York is 453, and the average density

of the southern states of New England is 360. Once more may New York enforce her claim as a busy hive of human kind. We take eight counties in western New York (Fig. 1). These do not look big enough to be a state, but they do not widely depart, in area or combined form, from Connecticut. The density is 219, as compared with 231 for the Nutmeg State.

Nearly all of the western New York tract is rich, arable land of the Great Lake plains and of the hills among the Finger Lakes. But a small share of Connecticut is equally adapted to tillage, and we are not there-

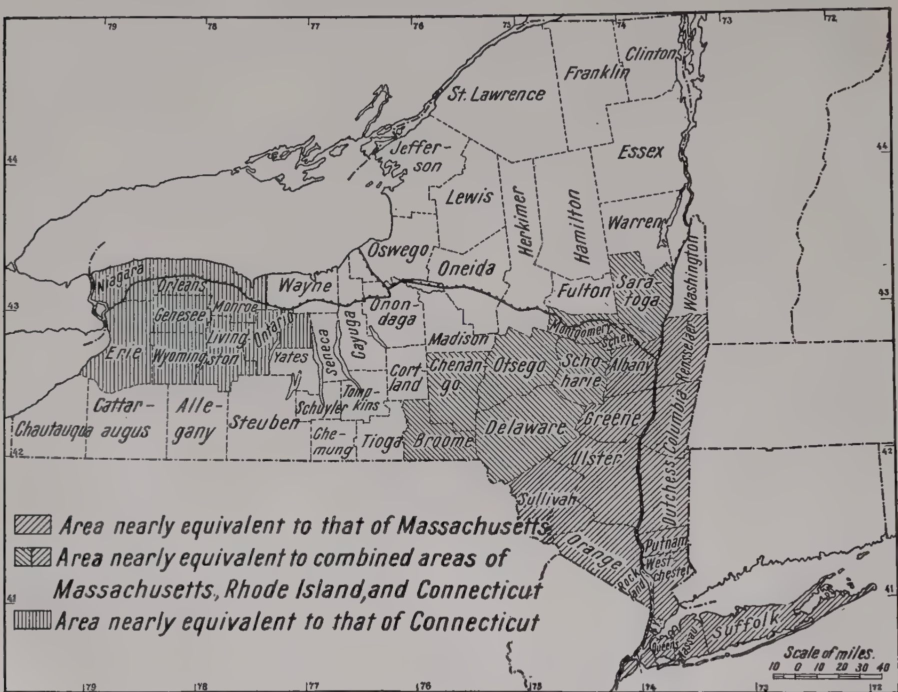

FIG. 1—Outline map of New York state showing county names and comparative areas. Scale, 1:5,680,000.

fore surprised when we compare the urban and rural population of the two areas. In face of the fact that Connecticut has no cities that compare in population with Buffalo and Rochester, she has 89.7 per cent of urban people, while the New York region has 55.4 per cent. Connecticut surpasses in the number of large towns and small cities, having seventy-two towns in the urban class, i. e. ranking above 2,500 in population. The New York region has but twenty-five such centers. The eight counties have seven cities with a population for each exceeding 10,000, while Connecticut has twenty-one such cities. It is clear that western New York, in some possible future equaling Connecticut's industrial activity, would far surpass her in population.

The center of population is near the village of Forestine, in Sullivan County (Fig. 6). It is, as we should expect, well to the southeast, in fact scarcely seventy miles from New York City. The growth of the metropolis has held steady control over the movement of the center, which in 1880 was in the southern part of Delaware County. The southward movement has accelerated steadily, being 6.5 miles from 1880 to 1890, 9.5 miles in the next ten years and 11 miles during the decade ending in 1910. In this last period alone the center swerved westward, a result apparently due to large increases of population in western New York.

We consider now the growth of population in the state as a whole, and we approach the record through a comparison with four typical states, one each in the New England, Southern, North-Central, and Western groups. We choose Massachusetts because she is like New York in diversified surface, industrial development, and accessibility to Europe. We select Alabama because that state is a good representative of southern agriculture, is open to the sea through an important port, and has, especially in iron, an industrial status. Illinois is, in her group, the natural analogue of New York, being rich in agriculture, far progressed in her factories, and open by lake and prairie to the continent. Washington is chosen because she is similar to New York in size, in her proportion of agricultural land, and in her potentialities of trade. All of these states, except Massachusetts, have important mineral resources. Massachusetts and New York are, for America, old; Alabama and Illinois are in middle age; and Washington is in the period of lusty youth.

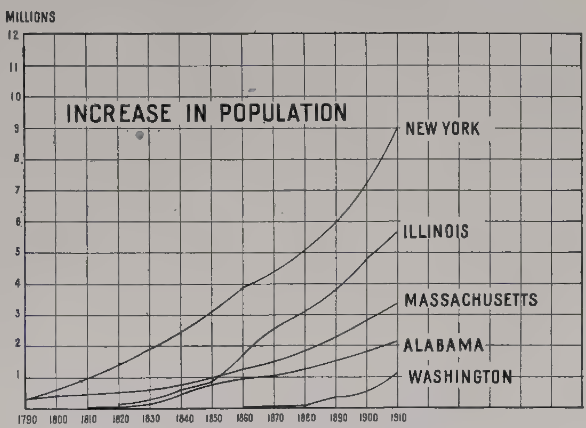

FIG. 2—Diagram showing the growth of population of New York state compared with that of other states.

Our first comparison of these four states with New York has to do with the actual increase and present totals. These facts are shown in Figure 2, the growth being set forth from the periods of earliest available data. It is well to observe, however, that this basis of comparison, while instructive, does not, owing to the variable size of the states, tell us much about the intensive development. And this is the more true because the duration of periods of growth varies from fifty to one hundred and twenty years.

Observing the curves of Figure 2 it is to be noted that those for New York and Massachusetts are more consistently progressive than any others.

The curve for Illinois is somewhat irregular throughout, though it is consistent in showing moderate growth from 1820 to 1850 and strong growth from the latter date to the present time. Illinois is a close parallel to Alabama to 1850 and then advances notably, nearly doubling in the following decade. The only break in the curve for New York is for the decade of the Civil War. Illinois is less apparently affected, but the curve flattens a little toward the end of that period. Massachusetts keeps her course, and Alabama becomes stationary for several years. In the last decade, New York's growth is largest, followed in order by Illinois, Washington, Massachusetts, and Alabama.

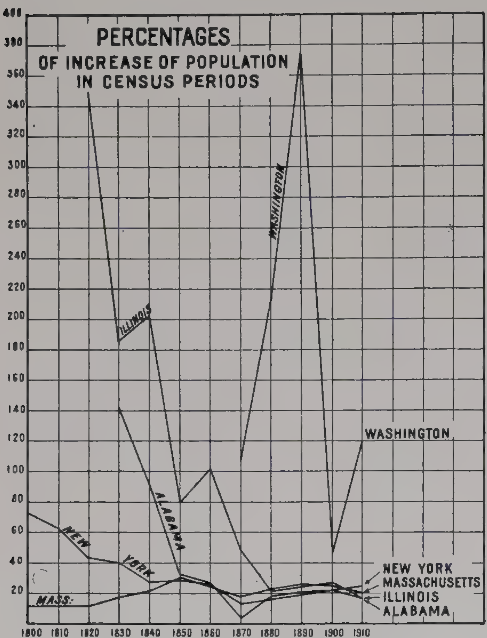

FIG. 3—Diagram showing percentage of increase of population of New York state compared with other states.

The next graph, Figure 3, shows for each decade the percentages of increase over the previous ten years. These are interesting but apparently erratic curves because of varying periods and conditions of settlement, but the curves show a tendency to settle down to a normal development. Thus New York and Massachusetts stand in sharp contrast until 1847, after which they are not greatly divergent until New York leaped ahead after 1900. Alabama, after a high percentage prior to 1830, comes down to a steady movement after 1850. Illinois with three long downward swings alternates two decades of upward movement and takes her place with her sober sister states in 1880. Washington has not yet lived beyond the prodigal spurts of her youth.

In turning now to Figure 4 we have the record of comparative increase of density of the five states under observation. This, it seems, brings us to the real test, by a criterion more satisfactory than either of the others. Here, however, the test would be more effective if the development periods had been of equal length. For this reason we can make no satisfactory comparison of Washington with any of the others. She has not had time to develop her capacity. We can, however, compare Alabama and Illinois with their coincident periods of population growth. They are close parallels from 1820 to 1850, as in Figure 2, but in respect of density Illinois is below Alabama in the early period and passes her in 1850. But here again

the curves do not show the actual capacity of the two states, because of the differences of political and social régime to which these states have long been subjected. New York and Massachusetts, however, may be more hopefully set side by side, for both are northern states, both are on the Atlantic seaboard, having comparable climates, and a similar historical and social groundwork. All of the states which go back to the time of the Civil War show at least a slight retardation in their increase of density. In the last Census decade all the curves have steepened except that of Illinois.

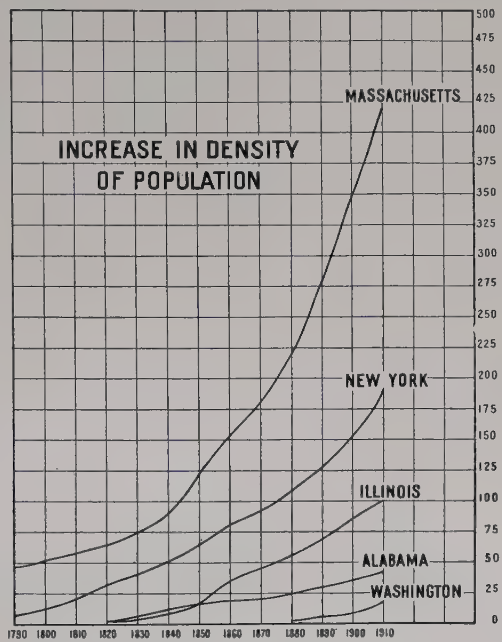

FIG. 4—Diagram showing increase in density of population of New York state compared with other states.

We now turn to the distribution and movements of population within the state. In Figure 5 are shown decreases of population from 1900 to 1910. The decrease of total population occurred in fifteen counties, about one fourth of the counties of the state. Of these fifteen, one is wholly in the Adirondack and two, Lewis and St. Lawrence, are partly in that province. Nine are wholly in the great plateau which stretches from the Catskills to the western border of the state. Greene County is divided between the Hudson Valley and the Catskills, while Madison and Ontario lie partly in the plateau and partly in the Lake Plains. Decrease has affected the lands of high altitude, severe climate, and lean soils, mostly regions of dairy and forest.

The general distribution of the rural population is to be seen in the maps of the federal census. The outstanding fact is that the rural population is most dense in the neighborhood of the larger cities. Thus Rockland, Westchester, and Nassau are the only counties having rural densities above 90. Densities of the next grade, 45 to 90, reach to Montauk Point and up the Hudson through Ulster and Columbia Counties. They then are found in Albany, Oneida, Onondaga, Monroe, Niagara, and Erie Counties, all containing large urban centers. This grade of density is found in a few counties which have no cities, no doubt by reason of exceptional conditions of soil and climate. Orleans, Livingston, Wayne, and Seneca Counties are examples.

There is not a single county having this grade of density of rural popu-

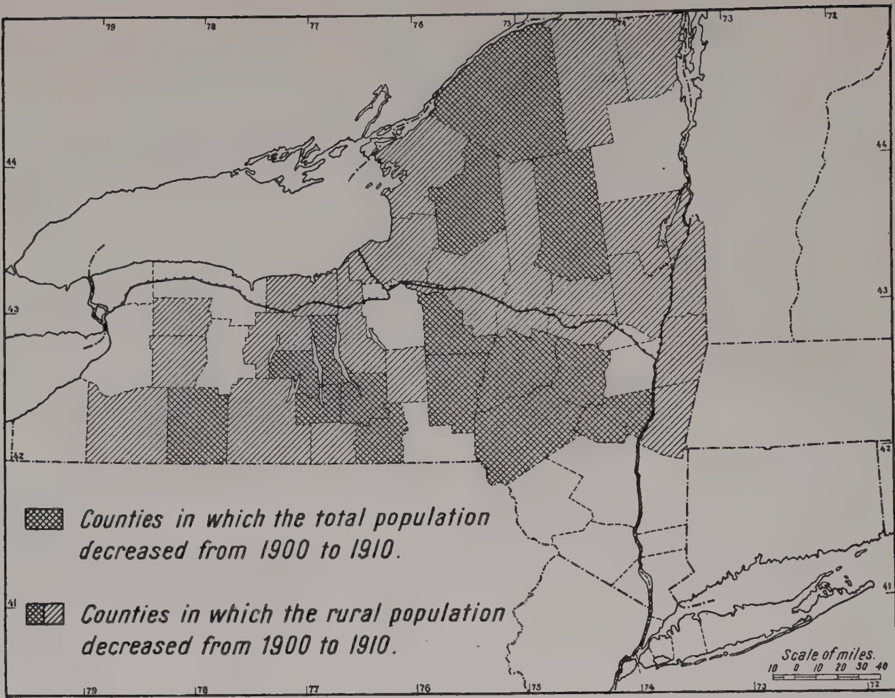

Fig. 5.

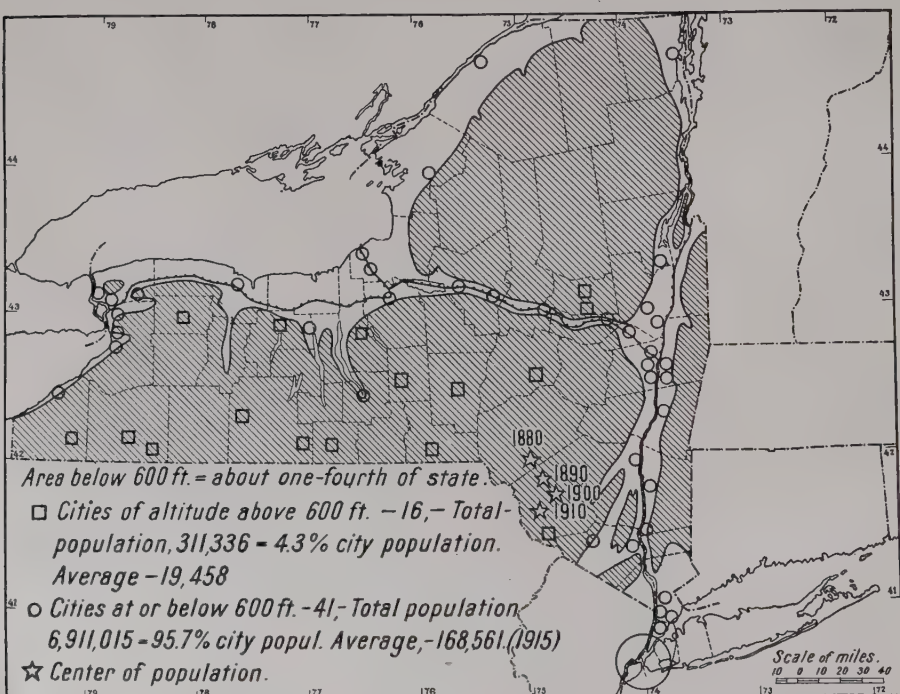

Fig. 6.

Fig. 5—Outline map of New York state showing the counties in which the total and the rural population decreased from 1900 to 1910.

Fig. 6—Outline map of New York state showing the relation of altitude to cities; also the movement of the center of population.

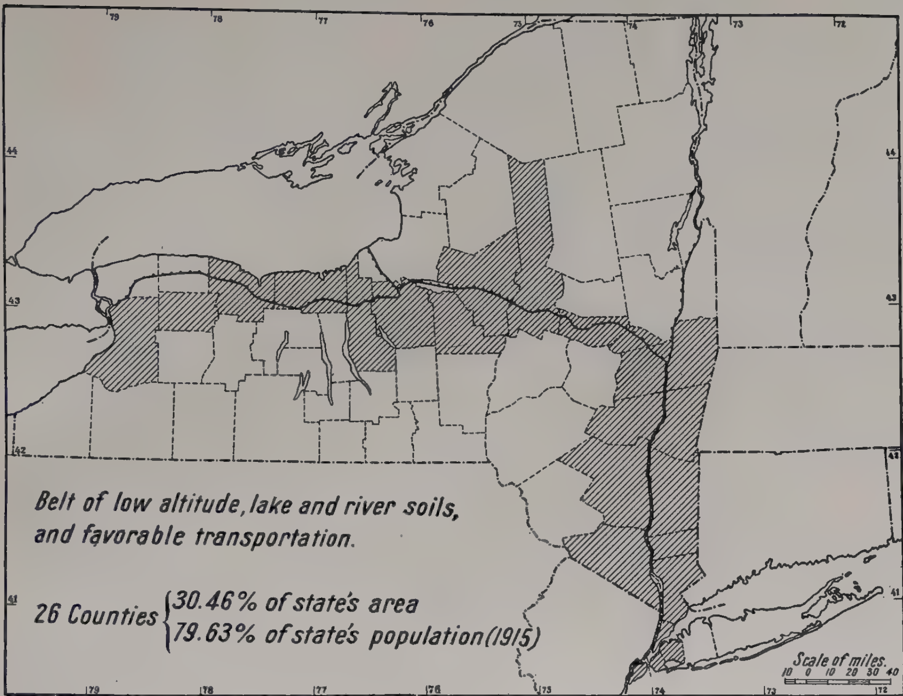

FIG. 7.

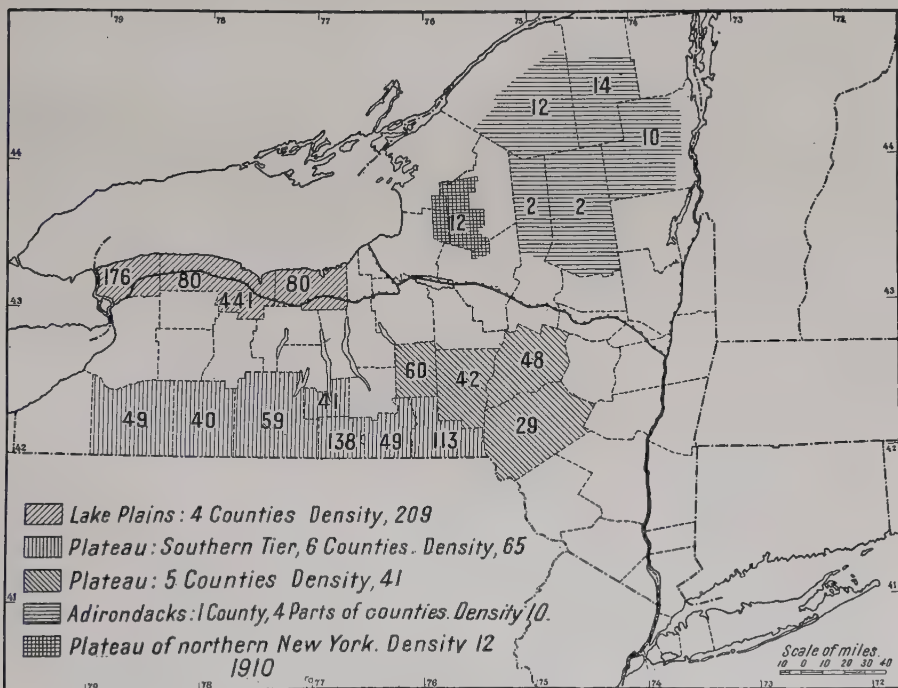

FIG. 8.

FIG. 7—Outline map of New York state showing the counties lying in the belt of low altitude, lake and river soils, and favorable transportation.

FIG. 8—Outline map of New York state showing the density of population of counties grouped according to physiographic regions. (*Note:* Schuyler County is incorrectly shaded; it should be included in the five plateau counties with a density of 41.)

lation in the "southern tier," from Sullivan to Chautauqua, nor a single example in the north and east from Oswego to Clinton, and from Clinton to Rensselaer.

The decrease of rural population in the last census period is more surprising than the losses of population as a whole, especially when we recall that the entire commonwealth had nearly two millions more people in 1910 than in 1900. The map (Fig. 5) shows that thirty-six counties out of sixty-one lost in rural residents. The rural population held its own in all regions lying approximately within one hundred miles of New York City. Beyond this limit only ten counties keep their rural status. All of these have urban centers except Orleans, Livingston, and Essex. Oneida is the only county having an urban center of more than fifty thousand people which did not hold its rural element. It is a bit curious that Oneida County, with the cities of Utica and Rome, should be in a different reckoning from Essex, an Adirondack county. It may perhaps be said that Essex had little to lose, much to gain.

It is not possible to give exact figures of the population in relation to altitude. Any contour lines crosses townships and election or school districts, and puts accurate data out of the question. Hence, choosing the contour of 600 feet, we will compare population centers, which stand in definite relation to such a line (Fig. 6). Approximately one-fourth of New York lies below this contour. There are in the state 57 cities, of which 16 are above the 600-foot line. These higher cities have an aggregate population of 311,336, giving an average of 19,458. Of the 41 cities on or below this line, the total population is 6,911,015, affording an average of 168,561. These figures are from the state census of 1915.

In addition to cities New York has 104 incorporated towns, each having a population of more than 2,500. Seventy-two of these are below the chosen contour, and their average population is 4,628. Thirty-two are above the line, and their average is 4,045. Of the hundred and more towns, thirty-five are a distinct response to the growth and needs of neighboring cities. Summarizing, all the urban population living below the line amounts to 6,781,547. The total for the greater altitudes is 440,804, or but 6.5 per cent of the whole. Thus it is as true in New York as in every part of the world, that people concentrate in regions of low altitude, of river, lake, and coastal-plain soils, of mild climate and easy transport.

We pass to what we may call a zone of cities and transportation, shown by shading in Figure 7. The map distinguishes twenty-six counties, chosen because they are traversed by the main lines of the New York Central Railway system between New York and Buffalo, or are directly served by them, as is the case with some of the counties of New York City. This belt of territory was described as regards its vital relation to the growth and trade of the United States in an earlier paper by the present writer.[2]

[2] The Eastern Gateway of the United States, *Geogr. Journ.*, Vol. 13, 1899, pp. 513-524.

Its significance as a population zone was set forth in a later paper[3] in which it was shown that it embraced about 30 per cent of the land surface of the state and held 77 per cent of the population. By the census of 1915 the precise figures are: area, 30.46 per cent; population, 79.63 per cent. Owing to the irregular extension of counties, the belt contains much thinly peopled land. Thus Greene and Ulster Counties reach far into the Catskill plateau, where villages are few and small and most of the land is covered with forest. The northern half of Herkimer County is in the Adirondack wilderness, with a density of 2 plus. A large part of Madison, Onondaga, and Cayuga Counties lies in the plateau, the line of traffic passing through the northern sections on the lake plains.

We should have a real test of concentration if we took a ten-mile strip from New York to Buffalo. The data are not available for such a computation, but if we take the series of townships crossed, it will come to much the same result. We shall have as a rule a single series of township areas in western and central New York, and a double series along the opposite banks of the Mohawk and Hudson Rivers, thus including the West Shore division of the New York Central lines. The average width of this belt is not far from ten miles, giving as a result, 6,910,131 people, or 70.87 per cent of the population on about 4,500 square miles, which form less than ten per cent of the territory of the state. This tract includes, except Binghamton, all the cities of New York whose population exceeds 50,000. It embraces also 28 of the 57 cities, while a dozen cities in adjoining counties are near at hand and are intimately dependent on this route.

Among the important criteria for the study of population is its relation to physiographic regions. Some attempt in this direction was made in compiling the statistics of the Twelfth Census, but studies of this nature are yet in their infancy, because we have as yet no accepted and detailed delineation of these provinces. This is true of New York as of other parts of the United States. Several natural regions can be outlined with a good degree of clearness for the state, and this will be attempted elsewhere by the writer. It is enough here to name certain well-known provinces such as the Appalachian Plateau, the Lake Plains, and the Adirondack region. Even if we had agreed upon boundaries, it would be difficult to determine population, for these lines cut all Census units of enumeration. But the density of typical parts of these regions offers a surer basis for study. Hence we take selected counties and parts of counties, whose populations are known. The areas for parts of counties are approximate.

Little comment is needed to supplement the map (Fig. 8). Four counties belong clearly and entirely to the Lake Plains province. Their soil is rich, their surface is easily tilled, the climate is favorable, and the transportation facilities are of a high order. Two contain cities and attain high densities, and two have no cities and show, by their common density

[3] The Distribution of Population in the United States, *Geogr. Journ.*, Vol. 32, 1908, pp. 380-389; ref. on p. 384.

of 80, highly developed rural conditions. The average density for the four counties is 209.

Six counties are taken in the Appalachian Plateau, in the "southern tier." They have high altitudes and are rather cold but are intersected by some broad and rich valleys. They have the advantage of an east-and-west transportation route, along the valleys of the Susquehanna and Chemung, which is second only to the route of the "eastern gateway." Two of the counties have cities of some size, Binghamton and Elmira, and show large densities. The others have small cities or none at all and show densities approximating 50. The average for the six counties is 65.

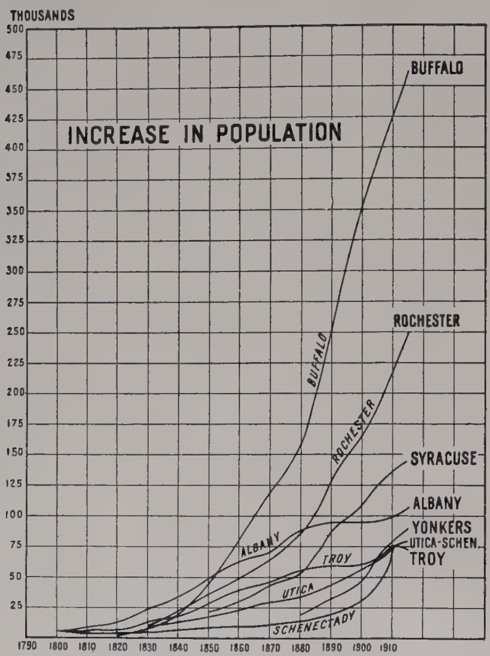

FIG. 9—Diagram showing the growth of population of the cities of New York state of over 50,000 inhabitants (except Binghamton and New York City).

Five counties from the same plateau are shown, which are similar to the others in surface and climate but sustain less favorable relations to through routes. Each of the counties but one contains a small city, but the average density drops to 41. In the Adirondack province we take one whole county, Hamilton, and four parts of counties, in Essex, Franklin, St. Lawrence, and Lewis. Here the surface is rugged, the soil poor, the climate severe, the surface mostly forested, and agricultural production is at a minimum. The densities range from 2 in Hamilton County to 14 in part of Franklin County, and the average is 10.

A small sandstone plateau lies between the Black River and the lake lowlands. The map shows selected towns in the central and higher parts of this area. The region is forested and is as truly a wilderness as the Adirondacks, and the towns included support 12 persons for each square mile. It is hardly too much to believe that detailed and intensive studies of population in reference to such natural provinces will lead us toward the inner meanings of geography.

The scope of this paper permits of little attention to that large theme, the location and growth of cities as affected by geographic conditions. The curves in Figure 9 compare the growth of the cities of the Empire State which exceed 50,000 in population, excepting the greatest, New York, and

the smallest, Binghamton. They all have the advantage of the state's major route of transportation.

The three older communities, Albany, Troy, and Schenectady, had attained about equal size in 1800. All have had but a moderate growth and find themselves not widely apart in 1915. Albany and Troy show a falling off in the decade of the Civil War, and both move on a level or in slight decadence from 1890 to 1900. Troy alone shows a sharp decline, from 1910 to 1915. Schenectady has a more consistent curve, with a long, slow rise to 1880, the growth quickening to 1900, strong to 1910, with retarded increase during the past five years.

The curves record the population of Buffalo and Rochester first for 1820 and 1830, and show steady, rapid, and rapidly increasing growths since 1830. These communities were little if at all affected in population growth during the Civil War period. Utica arose as a town considerably earlier than Buffalo, but her course runs coincidently with that of Buffalo from 1820 to 1835, when the latter city diverges on its long climb and Utica shows a smooth ascending curve, with retarded growth from 1910 to 1915 in coincidence with Schenectady. Yonkers is a newcomer among the large cities of the state and is to be regarded as a satellite of New York.

We may observe concerning the four large cities, Utica, Syracuse, Rochester, and Buffalo, that the population rank rises from east to west. There is not space here to substantiate the view which the writer holds concerning these cities, which is, that geographic conditions make Buffalo inevitably great; and that in view of geographic conditions Utica should have been as large as Syracuse, and that neither should have been so far outrun by Rochester.

By American standards, New York has a high density of population, and a large fraction of the state may be marked off whose people live closer together than in any other equal area in this hemisphere. Her growth in recent years puts out of court the notion that the East has reached its goal and that the West only is alive. Population is gathering in the cities, but it is also growing on the farms near the cities, where, by intensive tillage, the possibilites of our soil and climate are coming to light.

As everywhere else in the world, the greater number live on the lowlands, but lowland and highland, field and forest, lake and sea offer that diversity which enriches the life of all. The cities of the commonwealth, barely touched in this essay, hold out an alluring invitation to the student of geography.

It was in the mind of the writer to say something about New York's capacity for population, but the limits of this paper are already outrun and the handling of this fascinating but rather dangerous theme must lie in the future.

RECENT CHANGES IN BOGOSLOF VOLCANO

By SIDNEY POWERS, Ph.D.

Bogoslof, in Bering Sea, on the inner side of the Aleutian arc, is an unusual type of volcano, with pillar-like islands occasionally rising from the sea only to be in part or wholly destroyed by explosions. Since the earliest voyagers appeared in Bering Sea during the latter part of the eighteenth century, six islands have appeared, of which only three remain. These three peaks are now connected by sand bars and by the products of various volcanic explosions to form a single island.

The formation of the first island, Ship Rock, was reported by the earliest navigators about 1768, and the rock was not washed away by the powerful wave-attack of the open ocean until 1888. Old Bogoslof, now known as Castle Rock, was pushed from beneath the sea in 1796 as a solid rocky mass 4,000 feet in diameter and 350 feet in height. New Bogoslof (Grewingk or Fire Island) appeared in 1883 on the other side of Ship Rock from Old Bogoslof. The new island rose precipitously out of the sea to a height of over 800 feet, showing that it had been pushed out of an orifice in a very pasty condition instead of being formed of lava flows or ash which might accumulate around a crater.

Between 1883 and 1906 many changes took place in the forms of both Old and New Bogoslof, but no other islands were formed until March, 1906. In this month an island 2,000 feet in diameter and 400 feet in height appeared between Old and New Bogoslof. The names Perry Peak and Metcalf Peak were both given to this rock. The sides of the mass were described as being quite smooth and the top had the form of a "broken horn" as if the whole mass had been forced through an opening in the top of the submarine volcano. In the winter of 1906-07 half of Perry Peak was blown away and another spinelike mass rose not far away from the shattered side of Perry Peak. The new rock, McCulloch Peak, was about the same size and had the same form as the original Perry Peak, and, like the latter, was destroyed by an explosion ten months after its appearance, in September, 1907. Since this time nothing appears to have been published concerning the evolution of the volcano, and it is the aim of this paper to present what little information has been procured from the reports of government vessels.[1]

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[1] The early history of the volcano is described by C. Hart Merriam in "Bogoslof, Our Newest Volcano," report of the Harriman Alaska Expedition, Vol. 2, pp. 291-336, New York, 1902, abstracted by the author in the *Annual Rept. of the Smithsonian Institution for 1901*, pp. 367-375. T. A. Jaggar, Jr., visited Bogoslof in August, 1907, and describes the evolution of Metcalf and McCulloch Peaks in the *Bull. Amer. Geogr. Soc.*, Vol. 40, 1908, pp. 385-400. The material for the present paper was secured from the U. S. Coast Guard, and the writer is indebted to Mr. E. P. Bertholf, the Captain Commandant, for permission to publish the reports, with map, made in 1910 by Capt. J. H. Quinan of the U. S. Revenue Cutter *Tahoma*.

The explosion of September, 1907, which destroyed McCulloch Peak, left a circular hot lagoon where the rock had been (Fig. 1). The debris of the explosion was scattered over the beaches and bars which had connected Old and New Bogoslof and Perry Peak and was piled into ridges near Perry Peak and Fire Island (New Bogoslof). In July, 1908, the fragment of Perry Peak which remained since the explosion of 1906 is reported to have been no longer visible. The land between Old Bogoslof and Fire Island enclosed a deep bay, and some new land had been formed elsewhere. The absence of Perry Peak and the deep bay both point to another explosion in the winter of 1907-08.

Renewed activity in the bay between Old Bogoslof and Fire Island is reported in September, 1909. The bay had closed to form a lagoon, in which two small islands had risen, one of which gave off steam. The water in the lagoon was also constantly steaming. The two small islands were apparently just beginning to rise as new rocky spines, for on June 16, 1910, they are reported to have united and risen to a height of 178 feet above the lake level. Old Bogoslof, Fire Island, and the southwest shore of the lagoon remained the same as in the preceding year, but the new spines had become connected with the northeast shore of the lagoon, and a portion of the shore on that side had risen ten feet. Although the temperature of the salt lagoon ranged from 62° to 110° F., there was little activity in the new rock-masses and water was boiling up from only a few places near the lagoon.

A survey of Bogoslof Island was made on September 10, 1910, under the direction of Captain J. H. Quinan of the U. S. Revenue Cutter *Tahoma*, showing that the island was about one and a half statute miles long and three-quarters of a mile wide, as shown in Figure 2. The elevations of the peaks were: Fire Island, 175 feet; Castle Rock (Old Bogoslof), 289 feet; the higher of the two central peaks, 178 feet; the lower, 100 feet. The lower of the central peaks is given the name Tahoma Peak by Captain Quinan in his report, and the higher is called Perry Peak in spite of the fact that the remaining portions of Perry Peak were reported to have disappeared by July, 1908. In view of the records given above, it seems probable that Captain Quinan saw a new peak which rose in 1909-10 in the same place that Perry Peak occupied from 1906-08. No name is suggested for this new peak.

Steam issued from the base and sides of the new peaks at the time of the visit, and steam was issuing from the salt lagoon shown on the map. Between the new peaks and Fire Island, in the mud-covered area near the small lagoon, an area of several hundred yards was in violent agitation. Boiling water was being ejected through the mud, and in two pools, each about four feet in diameter, water was being thrown to a height of five feet by the rapidly escaping steam. Another seat of activity was on the northeast side of Tahoma Peak, at the edge of the main lagoon. Explosions had recently taken place here, according to Captain Quinan's report, and

a group of steaming conical rocks had risen since the explosion. The water around these rocks was boiling, but not so violently as near the smaller lagoon. The temperature of the water in the main lagoon was found to be 107° F. on the south side of the new peaks and 90° F. at the end nearest Fire Island.

The eruptions at Bogoslof are much more frequent than recorded, because no vessels are in the vicinity, but fortunately Captain Quinan sailed back toward the island on September 18, and when about twenty-five miles away

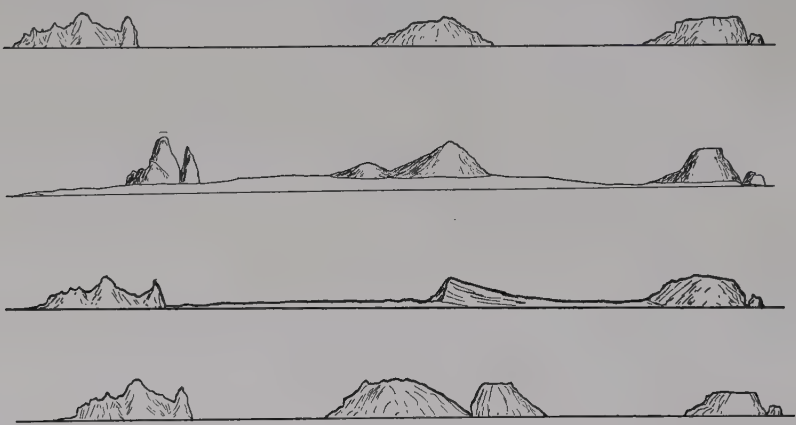

FIG. 1—Profile views showing the successive stages in the evolution of Bogoslof Volcano, from 1906-1910. (*Note:* The second and fourth profiles should be transposed. The explanation that follows refers to the correct order.)

In each of the sketches Castle Rock (Old Bogoslof) is on the left and Fire Island (New Bogoslof) on the right. In the first, Perry Peak is shown in the center as it was during the summer of 1906. In the second profile (August, 1907), Perry Peak remains as a half dome, and, on the side which has been blown away, McCulloch Peak appears. In the third profile, (September, 1907, after the explosion of McCulloch Peak), only a fragment of Perry Peak is left, and Old and New Bogoslof are connected by the debris of the explosion. During the interval between the third and fourth profiles the remainder of Perry Peak was destroyed, and, near the site, the two central peaks shown in the fourth sketch rose in 1909-1910 and are seen here in September, 1910. (The first three profiles are sketched from *Bull. Amer. Geogr. Soc.*, Vol. 40, 1908; the fourth is from the sketch by Lieut. A. H. Scally in 1910.)

in the early morning witnessed an eruption. Forked lightning in the direction of Bogoslof was seen before daylight, and when Bogoslof was sighted the new central peak was seen to be in a state of eruption. Immense clouds of vapor, smoke, and ashes issued from the peak and enveloped the entire island. Flames were reported at the peak, and lightning followed by thunder appeared in the cauliflower cloud of smoke and volcanic dust which rose to a height of several thousand feet above the island. The eruption lasted during the several hours the steamer remained in the vicinity, and two days later the central peak was observed to be still steaming.

The eruption of September, 1910, appears to have opened a true crater in the top of the central peak—the first important crater which has been reported on any of the masses of very viscous rock which have been slowly

pushed out from the top of the submarine volcano to form the "rocks" and "peaks" of the last hundred and fifty years. The opening of a small crater is merely the closing stage of activity for the particular peak and corresponds to the explosions which destroyed Perry and McCulloch Peaks. The gas and vapor found a place of weakness where they could escape without blowing off the entire carapace which confined them.

There are no reports for 1911 or 1912, and in July, 1913, a brief statement refers to the crater as being plainly visible with steam and smoke

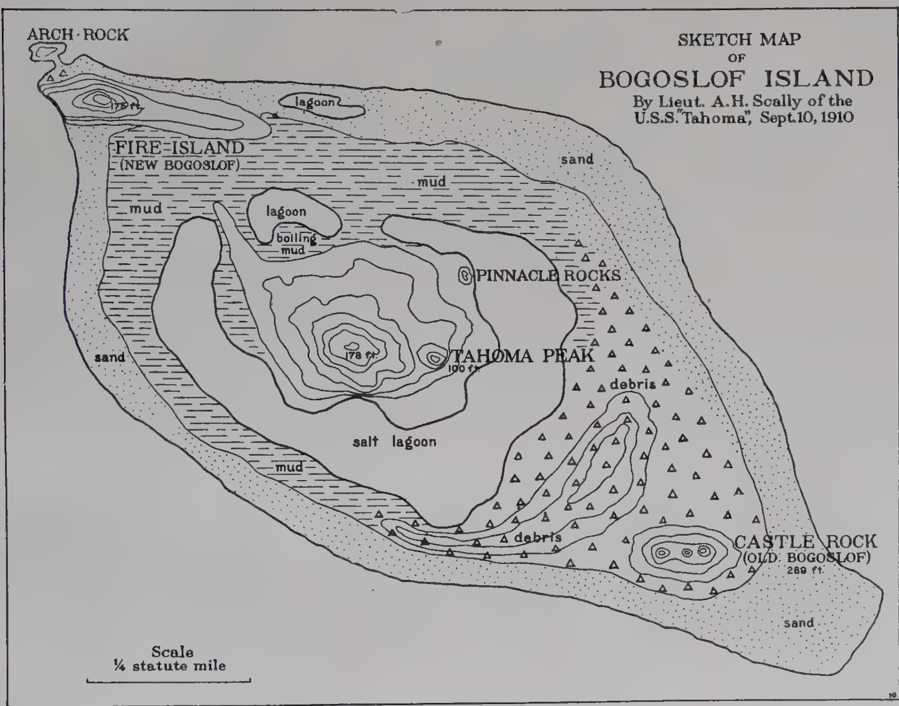

FIG. 2—Sketch-map of Bogoslof Island on September 10, 1910, showing Castle Rock, Fire Island, and the two new peaks in the center. Scale, 1:189,400. (From a map by Lieut. A. H. Scally of the U. S. S. *Tahoma*.)

slowly issuing from it. Activity apparently ceased during this year, for the commanding officer of the steamer *Patterson,* which passed Bogoslof on its way to pick up the survivors of the *Tahoma,* reports that "the Bogoslof Islands showed three peaks in 1914, none of which was smoking."

No reports concerning Bogoslof since 1914 are at hand. And so it happens that this active submarine volcano rising from depths of a thousand fathoms goes unnoticed from year to year so far as scientific information is concerned, and, although the port of Unalaska is only about 60 miles away, many peaks may rise and be blown away with no record of the event.

GEOGRAPHICAL RECORD

NORTH AMERICA

Recent Floods in the South. The flood which occurred in the mountainous region of western North Carolina after the heavy downpour of the night of July 15 illustrated in a practical manner the retarding effect of forest cover on the velocity of the run-off. According to measurement records of the Weather Bureau from 10 to 15 inches of water had fallen by the morning of the 16th. A flood of great velocity started on the headwaters of the Catawba River in the Blue Ridge, east of Mt. Mitchell. Its destructive effects, and that of other rivers whose sources lie in the same region, included the death of over eighty persons and the setting in motion of landslides and mud avalanches

FIG. 1—View showing the effect of the flood of July 15 in the upper valley of the Catawba River in North Carolina. Cornfield laid flat and buried in sand. This view was typical of all lowland areas along the river. As the corn was in tassel there was no possibility of a second crop. (Photo by H. H. Chapman.)

which carried and strewed great quantities of boulders, tree stumps, and other débris in their path, destroying farms and, in places, leaving a waste where soil had been worth $200 an acre.

Throughout the afflicted area the danger was heaviest where a protecting belt of timber was lacking to arrest the progress of the silt and wreckage carried by the stream. Furthermore, the upper slopes of the mountains had until recently been devastated by forest fires and lay bare of trees. The overwhelming mass of water swept, therefore, unchecked on to the lower slopes. In one instance, on the Catawba River, the farm of George Carson, which was almost entirely carried away, could have stood the fury of the flood had a thick grove of timber on an island lying directly above the farm not been cut for the purpose of bringing more land under cultivation. In this case, the island itself was destroyed and at least fifty acres of valuable bottom land were ruined.

Upon investigation (see ''Southern Floods and Their Forestry Lesson,'' by H. H. Chapman, *American Forestry*, August, 1916, pp. 476-479) it became apparent that the floods originated on steep slopes of high ridges. The steepness increased the normal run-off of the water and prevented absorption by the soil. The flood crests were particularly destructive, and a considerable portion of the total damage was due to their action, which

was likened to that of a bursting dam. Nothing but tree protection could have prevented the high flood crests and saved the river valleys from destruction.

About a month later, on August 9, floods devastated the valley occupied by Cabin Creek, a small tributary of the Kanawha, in the West Virginia coal district. Over one hundred lives were lost and millions of dollars' worth of property ruined. A large number of miners' cabins were swept away, rendering five thousand persons homeless. Four hundred square miles of bottom land were reported devastated. Eighteen miles of track on the Chesapeake and Ohio Railway were demolished. Every bridge was swept away. Railroad officials at the time declared it would take sixty days to rebuild the line.

A consequence of the excessive rainfall of that period was the bursting, on August 13, of the dam enclosing Lake Toxaway in North Carolina. The lake was an artificial body of water, having been created in connection with a summer resort. It was 550 acres in extent and 30 feet in depth and lay at an altitude of 3,000 feet on the

FIG. 2—View of flood effect of July 15 in Clear Creek, quarter of a mile below the junction of the upper forks. Forest ranger's frame house upstream hanging over the bank. In center, lower part of slide a thousand feet long, which crossed the stream. Site of a small sawmill on the left, which was completely destroyed, carrying boiler and engine several hundred feet downstream. One pile of lumber left, protected by a big drift of débris. Original channel of stream was 20 to 30 feet wide; the rest is cornland. (Photo by H. H. Chapman.)

Mississippi-Atlantic divide at the head of the French Broad River. It drained south through the Keowee River to the Savannah River. No lives were reported lost, but much damage was done in the lowlands of the upper reaches of the valley.

Forest Conservation and Stream Protection in the Southern Appalachians. Under the Weeks Law an important beginning has been made by the National Forest Reservation Commission (New England's Federal Forest Reserve, by Philip W. Ayres, *American Forestry,* July, 1915; abstracted in *Bull. Amer. Geogr. Soc.,* Vol. 47, 1915, pp. 875-876) in saving the steep mountain slopes of the South from deforestation and the train of evils that follow in its wake. The forests of the Southern Appalachians are the chief source of hardwood timber in the United States, and our future supply depends upon their conservation (The Southern Appalachian Forests, by H. B. Ayres and W. W. Ashe, *U. S. Geol. Surv. Prof. Paper 37,* 1905). They also hold the soil on the steep mountain slopes where otherwise it would soon be removed by erosion, since the region has the heaviest rainfall of any portion of the United States except the Puget Sound region, and frost action is vigorous. Through a careless system of agriculture many slopes, too steep for safe cultivation, have been cleared, farmed a few years, and abandoned because of gullying. Careless lumbering, forest fires, and, at Ducktown, the killing of the forests by copper smelting have aided soil erosion (Denudation and Erosion in the Southern Appalachian Region and the Monongahela Basin, by L. C. Glenn, *U. S. Geol. Surv. Prof. Paper 72,* 1911). The material eroded from the steep

slopes soon fills the channels of the small streams and increases floods and flood damages. It works down into the larger rivers, fills the storage reservoirs of the electric power companies, and builds bars and otherwise fills and obstructs the channels of navigable rivers, such as the Tennessee and others. The accompanying figure, based on a map prepared by the U. S. Forest Service, shows the large area affected by the streams flowing from the mountain area. It also shows how small the area already purchased is to the area that should be purchased to afford the needed protection. It is doubtless not intended that the area designated on this map as non-agricultural land shall

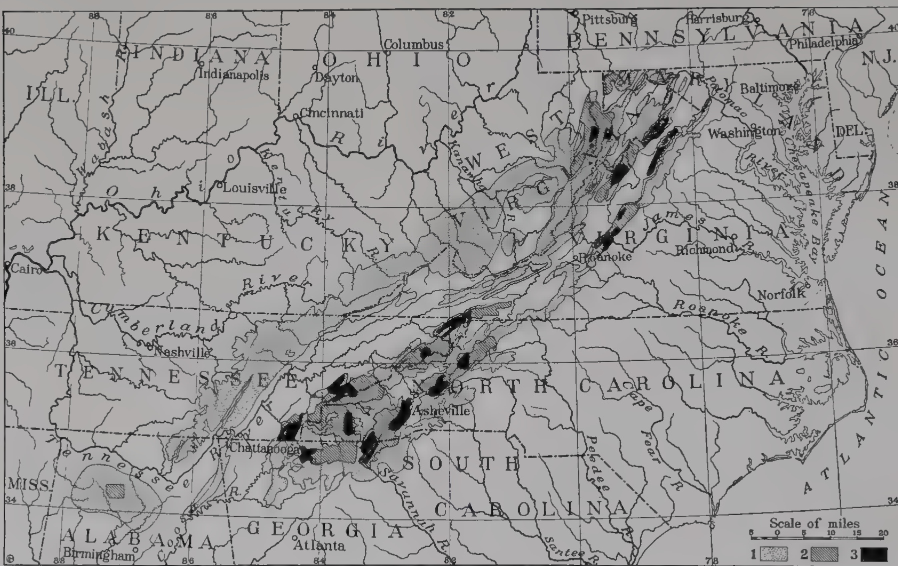

FIG. 1—Sketch-map showing the status of forest land in the Southern Appalachians, based on a map by the U. S. Forest Service. Scale, 1:10,750,000.

Key to symbols: 1, non-agricultural land; 2, areas in which land is being purchased; 3, tracts approved for purchase by the National Forest Reservation Commission.

be interpreted too literally, since in many parts of the region so designated there are stream valleys, level areas, and low slopes upon which a considerable agricultural population is found. The Weeks Law expired by limitation in 1915, leaving unexpended three of the eleven million dollars carried by the bill, and the Commission in its report to Congress in December last recommends a further appropriation of $10,000,000 (Further Appropriations Needed, *American Forestry*, Jan., 1916) for a period of five years to make additional purchases to protect the headwaters of navigable streams in New England and the Southern Appalachians. L. C. GLENN.

Currents Off the Alaskan Coast. A prevailing current flows northward and westward along the coast of British Columbia and Alaska at an estimated velocity of 0 to 1½ knots. It attains its maximum intensity near the coast, generally within the 100-fathom curve, and varies greatly with the winds. Details regarding conditions affecting navigation can be gathered from the "United States Coast Pilot for Alaska, Part II: Yakutat Bay to Arctic Ocean," the first edition of which has recently been issued by the U. S. Coast and Geodetic Survey.

It seems probable that the Japan Current does not reach the shores of the Alaska Peninsula and that it does not even attain the southernmost of the Aleutian Islands. The warm current generally believed to originate in the Gulf of Alaska and flowing westward along the coast to Unalaska Island appears to be continual. Its influence is reflected in the milder climate of the southern coast of the peninsula, and this accounts for the natives' preference to live in the locality rather than on the mainland coast, which is subject to Bering Sea influences.

The currents in the Aleutian Island passages are generally strong and almost always flow into Bering Sea. The temperatures in these currents are not high enough to war-

rant belief in their being part of the Japan Current. Southward of the Aleutian Islands there is often a current toward all the passages; but farther off shore, well out of sight of land, the Japan Current is found setting eastward. On the northern side of the islands the current sets eastward. Bad weather, as a rule, affects the regular flow of water in all the region, and an abnormal current is often a storm warning.

Land Developments in Arizona. Public attention in Arizona has lately been focussed on two Federal operations—the assignment of 2,000,000 acres of land for a Papago Indian reservation (*The Nation,* Jan. 27, 1916) and the range experiment now being conducted by the U. S. Forest Service (*The Independent,* Jan. 31, 1916). Both movements are in response to the scant water supply of southern Arizona. The Indians—Papagos and Pimas—have suffered from American and Mexican encroachments on their land and water rights, even in the reservations. A few Papago Indians are located on the Pima and two other small reservations, but the majority of the tribe, scattered over the northern part of the great Sonora Desert, has maintained the free and independent life so charmingly described by Carl Lumholtz in his "New Trails in Mexico."

The aridity of southern Arizona imposes a seasonal nomadism on its inhabitants. The Papagos, who raise crops on the flat valley floors in the summer, move in the winter to the better-watered sierras. The cattle ranchers, similarly, have their winter and summer ranges. The conservation of these, in a land where grazing must form the principal ultimate resource, is a matter of public concern. This is a part of the valuable work of the national Forest Service. Within the last few years reconnaissance work has been carried out on the Arizona ranges. Today an important experiment is in operation. Twelve years ago the depleted Santa Rita Range was withdrawn from the public. Now 50,000 acres, divided into four sections, two each for summer and winter ranges, have been opened to 800 head of cattle. The range includes two distinct types of grazing, the one characterized by mesquite, brush, and scant grass, the other by the excellent grama grass; hence it is well adapted to the experimental purpose.

EUROPE

Early Danish Hydrographic Surveys. The beginnings of chart-making in Denmark can be traced to the first half of the seventeenth century. This period is one in which notable progress was made in the Danish shipping industry. In August, 1622, Johan Isaksen Pontanus, the Royal Historiographer, was commissioned to prepare a Danish edition of charts of the coasts of Denmark. Prior to this time navigators had been obliged to rely on foreign compilations, mostly made in Holland. But the information collected on the foreign charts lacked accuracy, and the need of an actual survey was keenly felt by Danish seamen.

Pontanus appears to have been unable to fulfill the royal instructions, and it was not until 1688 that surveying operations of a practical value were undertaken. In the summer of that year a chart of the Sound was prepared under the supervision of Jørgen Dinesen Oxendorph, then Director of Navigation. The chart, however, was never published, according to a notice on the "Life and Cartographical Work of Jens Sørensen," accompanying the collection of charts prepared by this hydrographer and recently reproduced in facsimile and edited by Johannes Knudsen under the auspices of the Carlsberg Foundation at Copenhagen (F. Hendriksen, publisher). The same fate befell a chart of the entrance channel to the port of Copenhagen, drawn in January of the next year. Various attempts made before that time were equally fruitless. The appointment of Jonas Vestmand as Marine Surveyor in 1647 bore no results on account of his death in 1649.

The period of accomplishment dates from May 30, 1689, when Jens Sørensen's request to the king for "permission to make new charts" was presented. The applicant pointed out the serious errors contained in the Dutch charts, then the only ones available, and dwelt on the dangers lying in the path of Danish navigators sailing in home waters and especially in the Baltic. He also called attention to the knowledge of hidden reefs and shoals which he had acquired in the course of twenty-one years' experience in those waters. In proof of his earnestness he submitted the drawing of one of the charts he had prepared in person.

His petition was received with favor, and on the 11th of June of the same year he learned that the king had entrusted him with the task of "preparing for print new sea charts of the Baltic and our waters." In 1690 a vessel was placed under his orders for the carrying out of surveys in Danish waters. Special surveying cruises were undertaken in 1692, 1694, 1697, and 1703. In the years 1705 and 1706 Sørensen even

ventured to extend his observations to the Norwegian coasts of the Skagerak from Kjæringøen to Christiania and from the mouth of Christiania Fiord to Arendal. His field operations ended in 1706. While engaged in the task of drafting his results, the Great Northern War of the years 1709-20 broke out and prevented the Danish treasury from providing further funds for surveying work.

A comparison of Sørensen's charts with modern productions reveals the superiority of his work over similar publications of his contemporaries. His achievement is noteworthy when we consider the primitive character of his methods and instruments (his surveys were based only on compass bearings and measured or estimated distances, no positions being astronomically determined) and the fact that his scientific education had been neglected. His great familiarity with Danish waters, added to a keen power of observation, alone enabled him to produce the accurate outline of the Danish coast and the complicated system of its waters. Unfortunately the international conditions then prevailing prevented his charts from being published. The Danish Admiralty was adverse to the dissemination of the information which he had gathered. His charts were used only on board the king's ships, even merchantmen of Danish nationality not being allowed to keep copies.

The Population of the Baltic Provinces of Russia. An article on the inhabitants of this region, written from the German standpoint, is contributed by Dr. H. Rosen to *Petermanns Mitteilungen* for September, 1915 (see the entry in the March *Review*, with comment on the accompanying map). The three Baltic provinces of Courland, Livonia, and Esthonia are considered as a domain of German culture and of Protestant faith controlled by Russian political and religious power. Persistent attempts to Russify the region have been carried on since 1880 without, however, producing noteworthy results. In the revolutionary period of 1905 this section of Russia was considerably affected. The Lettish element in its population is considered as a mixture of Aryan and Finnish peoples, this being somewhat at variance with the generally accepted belief in the purity of the Aryan stock peopling these provinces. The Esthonians, too, according to Doctor Rosen, are a product of the blending of Finnish and Teutonic peoples. He cites in point the Fellin district in southern Esthonia, where a very pure Teutonic type is met among peoples of Esthonian speech. The Poles who inhabit these provinces number some 36,000 individuals and are represented as being strongly Germanized. The 62,686 Jews who make up 2.65 per cent of the total population are also faithful supporters of German ideas.

The Lithuanians are distributed mainly in the governments of Kovno and Suwalki, which adjoin the German province of East Prussia. They consist of Lithuanians proper and of Shamaits, otherwise known as Zhmuds. Very few dialectical differences exist between the two. The latter cluster mostly in northwestern Kovno without, however, attaining the Baltic shore. According to the last available Russian census (1897) they number 1,638,530 inhabitants, of whom 1,113,853 live in the Kovno government, 304,548 in Suwalki, while 220,129 are distributed in the Polish and Baltic governments. Emigration in the past decade to large Russian cities and America has decreased their number appreciably. The Lithuanian as a rule is not on the best of terms with neighboring peoples. He looks upon the Russian as his political oppressor and upon the Pole as his hereditary foe. The Lett is regarded, with somewhat less animosity perhaps, as a rival.

A Masurian element constitutes the majority of the inhabitants of Augustovo and Seiny, the two southernmost districts of the government of Suwalki. The German element is strongly represented in the entire region. It forms a contingent of some 70,000 individuals in the governments of Kovno and Suwalki. In the province of Courland the Germans boast of 51,000 resident kinsmen. As a rule this section of the population is confined to the cities. Riga, Reval, Libau, Dorpat, and Mitau each contain notable percentages of Germans among their citizens. The first-named city numbered 65,332 of these westerners in its population, or over 25 per cent of the total.

The Winter Climate of the Eastern Mediterranean. Major H. G. Lyons, President of the Royal Meteorological Society, read a paper on the winter climate of the eastern Mediterranean before that society at its January meeting (*Quart. Journ. Roy. Meteorol. Soc.*, April, 1916). Taking into consideration the special interest in the eastern Mediterranean at the present time, the author considers it important to study the climatic conditions of that region because of their bearing upon naval and military operations. Meteorological observations and problems now have a very practical value. The general weather characteristics of the eastern Mediterranean range from the rigorous continental type met with in the high plateau of the Balkan states to the uniform Mediterranean type of southern Greece and the Levant and the subtropical climate of Egypt. In the Balkan Peninsula, temperatures of 0° Fahrenheit have frequently been

recorded on the high plateau up to the month of March, and it is only when nearing the Aegean Sea that there is a mean temperature above 32° for all the winter months. Associated with the continental type, the monthly precipitation is comparatively uniform, taking the form of heavy showers rather than of continuous rain. In the coastal region the winter months have heavy rainfall. In Egypt the rainfall of the winter months is insignificant. Snowfall is reported as far south as Athens, but even at Saloniki the days with snow are few. Inland, the number of days with snowfall increases to about one-third of the days with precipitation in the Bulgarian hills. Severe conditions occur occasionally at Saloniki, where, in 1903, the sea was frozen for two days to a thickness of 1 centimeter. In regard to the gales which have been frequently experienced in the Aegean Sea during the progress of the war, it is the opinion of Major Lyons that those from the southwest do not appear to have been common in past years, but may be considered generally to be the result of cyclones passing over the north of the Balkan Peninsula or approaching the west of Greece. These are normally of short duration, lasting seldom more than one or two days. The normal winter pressure distribution, however, with anticyclonic conditions over Russia, and extending to the Balkans, favors a gravitational flow of cold air from the north. When associated with marked cyclonic conditions in the south, northerly gales hold for four, five, or six days. R. DeC. Ward.

Junction of the Greek to the Main European Railroad System. The recent completion of the railroad link along the Aegean between Gida on the Saloniki-Monastir line and Papapuli, in Thessaly, will, after the war is over, put Athens in direct rail communication with all European points northwest of the Balkans. According to *Commerce Reports* (May 27, 1916, p. 771) the connecting line is 56 miles long and transportation was to begin during May.

The roadway will benefit Athens and the Piraeus particularly. The journey between Paris and the Greek capital will be reduced to some sixty hours. Part of the freight routed to cities in Asiatic Turkey, via Constantinople and Saloniki, will probably be diverted to the Piraeus and shipped thence by water to Smyrna. Furthermore, thanks to its through connections, the port of Piraeus now becomes the European railhead nearest to Egypt and the water route to India. It may therefore attract in time part of the Indian trade and enable European lines to compete with the much-advertised, though still incompleted, Bagdad Railway.

Greece's economic condition will change materially through this important connection. A European transcontinental line ending at Athens is bound to affect Greek maritime trade in general. Locally, the bringing of Saloniki to some twelve hours' ride from the capital must also cause readjustments in internal trade.

Rumanian Trade with the Warring Nations. Prior to Rumania's declaration of war, the swinging of her political pendulum between the two hostile groups in Europe was the subject of much comment. A survey of the country's economic geography and the analysis of figures supplied by Dr. Luigi Bissoli in the March, 1916, number of *L'Esplorazione Commerciale* of Milan is illuminating in this connection. Rumania, like all the Balkan states, is essentially an agricultural country. It exports the products of its fields and imports industrial goods. Fully eight-tenths of its exports consist of cereals, part of which was supplied to the Central Powers before the outbreak of the European War. The participation of Turkey in the hostilities cut off Rumania completely from intercourse with France and her allies, as the Dardanelles route was blocked. With Russia herself carrying an unprecedented surplus of cereals, Rumanian agricultural products naturally found their way to Austria and Germany when the demand was keenly felt.

But if Rumania found a market for her cereals in Teutonic countries, her attempts to become a country exporting live stock were thwarted by the high tariffs raised by Austria-Hungary against Rumanian hogs and cattle. The Rumanian farmer therefore entertained a grievance against the government of the Dual Monarchy, and the country's determination to fight must be considered in part as an attempt to break through this foreign economic bondage.

Rumania's most pressing industrial needs, consisting of coal and steel products, could likewise be supplied by the Teutonic Powers. Russia, the only member of the Entente which Rumania can reach by direct communication, cannot purvey to Rumania on account of her own needs. Without German coal, Rumania's small but thriving industrial activity faced complete cessation until the end of the war. This dependence of the eastern Latin state on the countries of Central Europe became inevitable with the closing of the Dardanelles seaway and the Bulgarian land routes.

Prior to the European War, approximately 64 per cent of Rumania's imports came

from Germany and her allies as well as from Belgium. The value of this trade amounted to about $77,000,000. From the Entente countries Rumania imported about $38,000,000 worth of goods; 56 per cent of its exports, valued at $79,000,000, went to the Teutonic group. The Allies' share was 24 per cent, representing $34,000,000. The balance found its way to Egypt, Gibraltar, Holland, and Belgium. It is interesting to note that the bulk of Rumanian wheat in the years 1911 to 1913 was directed to Belgium, whence it was reshipped to English and German localities of consumption.

Rumania's intercourse with Russia is necessarily limited on account of the identity of the economic conditions prevailing in both countries. The requirements of both countries are likewise similar. As long as Rumania's maritime commerce with Italy and France is hindered by the closure of the Turkish straits, the country will naturally turn to Central Europe for commercial exchange. But Rumania's entry into the war indicates that the Entente Powers have either succeeded in finding means of supplying her with industrial products, through the great improvement in Russian rail communication of the past two years, or else it is a sign that the Russian staff, working in conjunction with the Allies' forces in the Balkans, foresees the possibility of establishing maritime communication with Europe, by the Aegean, after having forced a way through Bulgaria.

AFRICA

The Position of the Suez Canal in World Politics. The repeated efforts of Turco-German armies to wrest the Suez Canal from British hands have awakened widespread comment in German periodicals. The *Geographische Zeitschrift* in its February number contains an article on this subject by Arthur Dix (Die verkehrspolitische Bedeutung des Suezkanals, Vol. 22, No. 2, pp. 87-91) in which the value of the waterway to England is explained. According to this writer over a fourth of the total British tonnage on sea passed through the Suez Canal in 1912. The traffic by nationality for that year is given as follows:

NATIONALITY	NUMBER OF VESSELS	TONNAGE
British	3,335	12,840,000
German	698	3,025,000
Dutch	343	1,240,000
Austrian	248	814,000
French	221	799,000
Italian	143	368,000
Russian	126	364,000
Japanese	63	320,000
Danish	45	139,000
Swedish	38	138,000

In value also about the same proportion exists between the total British export trade and the amount routed via Suez. The figures are given as 26.8 billion marks ($6,700,000,000) and 6.3 billion marks ($1,575,000,000) respectively. It is pointed out that the loss of the Suez Canal cannot be conveniently offset by the possibility of sending freight via Panama or the Cape routes. The cost of transporting is raised considerably by the increase in time and fuel consumption. It would affect England seriously, because a considerable quantity of its imported raw products are derived from India, the Far East, and Australia.

The Bagdad railway, controlled by Germany, and German East Africa are considered the two great rivals of the Suez Canal. When completed the Turkish line will provide Central Europe with a direct land route to the Persian Gulf and India. The traffic of the Suez Canal may be reduced somewhat by the operation of this new line. The German East African colony lies in the path of traffic directed towards Suez from an important portion of Africa. Moreover, it occupies a position from which it can threaten the Sudan. In a perhaps somewhat far-fetched vision the German writer attributes British possession of the Sudan and Uganda to the desire to reinforce the hold obtained at Suez.

All this explains the continued attempts on the canal, the recent one, early in August, having been thwarted like its forerunner in February. A successful attack at this vital spot of the British Empire would jeopardize both England's and her allies' chances of success in the present conflict. It is impossible to realize exactly the nature of preparations made by the British staff east of the waterway, but the recent rebuff of the Turks increases the probability that practically impenetrable lines have been constructed. The region is not as flat as is generally believed. Its surface is undulating, and the difference in levels is sufficiently pronounced to make it convertible into a strongly fortified

area. Of the three routes leading towards the canal from Turkish territory, the northernmost, running behind the sand-dunes of the Mediterranean, is alone well supplied with water. To the south lack of water is a hindrance to the movement of large bodies of men.

The Past and Present Water Supply of Cyrenaica. In the *Geographical Journal* for May, Professor J. W. Gregory presents a valuable and interesting discussion of the resources and prospects of Cyrenaica (modern Barca), the plateau on the north African coast opposite Greece which was a flourishing region during antiquity. The vital question is whether the climate is now the same as in the days when Cyrenaica was "an earthly paradise." Even within the last century travelers visiting the country in rainy years have described it as like an English park, but according to Professsor Gregory, it is "an arid, karst-land horst" with "a deplorably limited water supply" and only slight prospects of development. Yet he holds that the climate is now the same as when "the plateau produced abundant crops of corn; its coastal plains grew rice and dates; . . . . and its citizens proved famous for intellectual power and physical prowess." As a necessary corollary he believes that the *silphio,* a medicinal plant once held in high esteem, must "have been deliberately exterminated in ancient times."

Fortunately Professor Gregory employs concrete figures. Take, for example, Cyrene with its ancient wall about four miles in circumference and its cemeteries of unparalleled extent. Its springs, as measured by Professor Gregory's party in the summer of 1908, yield "only a paltry 84,000 gallons a day," while its reservoirs, which were dry in 1908, have a capacity of only one and a half million gallons. On the basis of this water supply he estimates that the population of Cyrene cannot have been more than 15,000 to 25,000. This allows ten gallons per day per inhabitant; but deducting the "water that would be used for cattle and stock and irrigation, ... the amount . . . . left for personal use would be only two or three gallons."

Mr. D. G. Hogarth, in discussing the paper, says that we have "singularly good authority that the city of Cyrene had a population of over 100,000 persons." He suggests that the discrepancy between the present water supply and the past population may be because there were many slaves in ancient Greek cities, and they used less water than freemen. If we accept Professor Gregory's figures as to water supply and Mr. Hogarth's as to population—the points in which the two men are respectively authorities—the present water supply would in ancient times have sufficed to give only about two and a half gallons per day per person for all purposes, or one fourth as much as Professor Gregory considers necessary. Moreover the rainfall at Benghasi, the nearest place with a record, averaged only 11.1 inches from 1891 to 1905. At similar places in the United States the rainfall often declines to only 5 or 6 inches. This would not suffice to fill the reservoirs at Cyrene, and the water supply from the springs alone would be scarcely one gallon per person. A great city, whether slave or free, could scarcely exist when frequently confronted by such conditions for months or even years. ELLSWORTH HUNTINGTON.

ASIA

Activities of an Anthropological Expedition in Arctic Siberia. We are now able to outline the work of the anthropological expedition to Siberia under the joint auspices of the University of Pennsylvania Museum and the Oxford Committee for Anthropology, to which reference was made in the December, 1915, *Bulletin of the American Geographical Society* (p. 960). The headquarters of the expedition were established at the head of the estuary of the Yenisei River, 400 miles below the extreme limit of the great forest belt. Camp was reached down-river by a small paddle-wheel steamer brought there thirty years ago by the Captain Wiggins who reopened the northern trade route through the Kara Sea, a route, it will be recalled, that has been the subject of much comment during the last year. Good opportunities were found for the study of the Samoyedic and Dolgan tribes that frequent the coastal lands of western Siberia. The latter, described as Yakutized Tungus, roam over the country between the upper Khatanga and the mouth of the Yenisei. Much material was collected on the shamanism that still permeates the culture of these peoples of reindeer civilization. The oldest racial element in the lower valley was found to be the Yenisei Ostyak, now limited to the country immediately above the river settlement of Turukhansk. This people represents the fast-disappearing remnant of a fair-haired, blue-eyed stock, the major part of which, dwelling to the south, has been absorbed by Turkic invaders.

The expedition wintered among the Tungus of the Limpiisk tundra, east of the Lower Yenisei valley. These people are less dependent on the reindeer than the

Samoyeds. They are energetic hunters and fishers. On the return journey the expedition devoted a short time to a study of the *kurgani*, or burial mounds, of the Abakan steppe. The so-called Tatars dwelling on the steppe have been considerably affected by Russian influence. Not a few have abandoned nomadism for agriculture. (H. U. Hall: The Siberian Expedition, *Univ. of Pennsylvania Museum Journ.*, March, 1916, pp. 27-45.)

Reforestation in China. The *Review* called attention in its April number (pp. 301-302) to afforestation undertaken in China for the purpose of protecting bare hills and plains. Further news of this work is gathered from communications sent by the College of Agriculture and Forestry at Nanking. By means of circulars to Chinese provincial governors, chambers of commerce, and leading newspapers, the institution is calling attention to the dangers of agricultural insect pests and fungus diseases. The practical character of its labors is thus laid before the Chinese, who, in many instances, have shown appreciation. A significant step was taken by the Ministry of Agriculture and Commerce at Peking in 1915, when all the students of its forestry school were transferred to Nanking for training.

The varied activities of the Nanking forestry school comprise the systematic development of the native fruit industry. The Chinese have no general knowledge of the valuable varieties. Neither do they know which districts in their country are best suited for these. Valuable knowledge is being disseminated among them through the co-operation of missionaries. These devoted pioneers of Western ideas also render great assistance by giving reliable information about the districts with which they are familiar.

Perhaps the most significant proof of the Chinaman's awakening to the importance of his forests is revealed by a recent decision of the Chinese Minister of Agriculture and Commerce which calls upon the Chinese to observe Arbor Day. According to a recent issue of *Commerce Reports* (May 26, 1916, p. 765) five thousand magistrates in the country were instructed to invite the people of their respective districts to plant trees on that holiday. The example was given to the nation by the minister in person, who, on April 6, the occasion of the "Ching Ming" national holiday, went to the hills west of Peking in company with officials of his department and of the School of Forestry in order to plant a number of trees. The conversion of the "forestless" nation into a country containing an important acreage reserved for trees of commercial value, will, it is hoped, be marked by these beginnings.

Tachienlu, the Chinese Gateway to Tibet. For centuries Tachienlu (30° N. and 102° E.) has been the main gateway into Tibet. The highroad that runs through it from Pekin via Lhasa to Leh in Cashmere has permitted the western flow of Chinese conquest, trade, and civilization. Tachienlu marks the natural boundary to this spread. It is situated on a line of geographical and ethnological cleavage: eastward the country is in all respects Chinese, westward it is Tibetan save for the sprinkling of Chinese officials and traders. The town is a trading center, for its location defines not only a change in products but also in transportation. Goods from Yachow, the western depot of Szechwan, are carried by coolies to Tachienlu: there transport for the high plateau is exchanged to yak, mule, or pony. Apart from a small local and retail trade, business is transacted between the Chinese firms of Tachienlu and the Tibetan merchants coming in with their annual caravans. Goods are chiefly obtained by barter, but a few merchants are buyers or sellers only. The former pay in gold dust or in the Chinese rupee, a coin specially minted for frontier use, and the latter accept the rupee or silver. Exceptionally one or two merchants of high credit remit their accounts direct to Shanghai via India. The principal trade of Tachienlu is in brick tea, an item that during an average year accounts for some $700,000. It is controlled by a system of licenses issued by the provincial government and distributed by the Tea Guild under what are practically monopoly conditions. Revenue from the sale of licenses is now devoted to frontier administration. Since 1910 Tachienlu trade has shown a decline. Tibet has been supplied with tea to some extent by India, by trade channels that are almost certain to develop at the expense of the Chinese route (Report for the Year 1913 on the Trade of Tachienlu, *Diplomatic and Consular Repts.*, Ann. Series, No. 5561, London, 1916).

Disputed Sovereignty over a Philippine Island. From a Dutch source (*De Indische Gids*, Vol. 37, 1915, No. 12, p. 1754) comes the information that the sovereignty over Palmas, or Miangas, Island, a small island in 5°35′ N. and 126°35′ E., southeast of Mindanao, is in dispute between the governments of the United States and the Netherlands. While its position places it within the limits of the islands ceded by Spain to the United States according to the Treaty of Paris of 1898, the proximity to

their East Indian possessions seems to have prompted the Dutch to claim it. The fact that the Dutch have made the only available survey of one of its anchorages (see inset on U. S. Coast and Geodetic Survey Chart No. 4724) attests their interest in the island. The dispute is, according to a recent Dutch "orange" book, to be settled by arbitration.

POLAR REGIONS

Rescue of the Marooned Men of Shackleton's Weddell Sea Party. Shackleton's repeated efforts to rescue the twenty-two men who were left stranded on April 24 on Elephant Island in the South Shetland group, as related in the July *Review* (p. 56), have at last been crowned with success. A brief cablegram from Shackleton dated Punta Arenas, September 3, says that all the men have been saved and that all are well.

Details of the rescue are given in a cablegram from Shackleton to the *New York World*, published in its issue of September 5. On this, the fourth attempt, a course was set to approach Elephant Island from the northwest, as Shackleton hoped the ice would have worked toward the northeast. This hope was realized and, on August 30, after steering in the fog through the numerous stranded bergs, the camp of the marooned party was reached at 1 P. M. All were well, and an hour later they were homeward bound.

The men had endured many hardships since Shackleton left them on April 24. The day after his departure the island was beset by dense pack ice. The party was confined to a narrow spit of land 250 yards long and 40 yards wide surrounded by inaccessible cliffs and ice-laden seas. The party was forced to abandon the ice hole in which they had first taken refuge; they made a dwelling of their two boats, supported by rocks and set up as far as practicable from the sea. The weather continued appallingly difficult to work in, and the vitality of the whole party was lowered owing to exposure.

In May a heavy blizzard swept much valuable gear into the sea, and there was great danger that the men themselves would be swept away by the heavy seas. Fortunately, owing to the low temperature, an ice foot formed on the seashore, and this protection was the means of saving the party from total destruction. On several occasions the adjacent glacier calved, throwing up heavy waves, and on one occasion blocks of ice were hurled to within fifteen feet of their dwelling.

Realizing what difficulty Shackleton would have to reach them, Frank Wild, in command of the party, took drastic measures to insure a sufficient food supply. At first only one meal was allowed daily, until the reserve of blubber had been increased. The special rations were only used for two meals weekly and supplied a vital change in the diet. The meat supply, which was greatly depleted, was periodically replenished by small penguins. No seals could be killed after the May blizzard, as they were unable to land because of the ice foot. At the beginning of August, the men were able to collect seaweed and limpets, which formed a valuable change in their diet. Thus life was successfully maintained.

From June on the weather was better as regards wind, but the party was under a constant pall of fog and snow. In the middle of the winter the toes of one of the men had to be amputated. Whenever the sea opened, the men's hopes of relief were renewed. Shackleton's three previous attempts at relief, it develops, had synchronized with times when the island was beset by ice. The fourth attempt was successful because on August 28 a gale had driven the pack from the island.

Of the four attempts undertaken by Shackleton to reach his stranded companions, the first was made from South Georgia on May 23 in a whaling vessel furnished by a Norwegian whaling station. The boat was unable to penetrate the pack ice and so made for the Falkland Islands, arriving at Port Stanley on May 31. It was from here that Shackleton telegraphed an account of the drift and fate of the *Endurance* (see the July *Review*, pp. 54-57, with map). The second attempt was begun on June 8 when the steamer *Instituto Pesca* of the Uruguayan Bureau of Fisheries left Montevideo, stopping en route at Port Stanley on June 17 to pick up the explorer. On June 25 the attempt was abandoned, as it was impossible to reach Elephant Island because of the ice. The ship had been able to approach within twenty miles, however, and it had been ascertained that penguins abounded on the island. This made it seem probable that the men would be able to subsist until help came, although they had only five weeks' rations with them. On July 13 Shackleton made a third attempt, sailing from Punta Arenas on the schooner *Emma*. This trip, too, was a failure. The schooner was forced back by heavy gales and ice fields and, with engines injured and hull battered, put back to the Falkland Islands on August 4. The final and successful trip was begun on August 26 from Punta Arenas on the Chilean government steamship *Yelcho*, which on the previous attempt had been used to tow the *Emma* as far as possible on

her way. Had this last trip been unsuccessful, Shackleton would have gone south in the *Discovery,* Scott's old vessel, which was being fitted out in England by the British government for the purpose.

The rescued men include: Frank Wild, second in command of the expedition and commander of the party on Elephant Island; James Wordie, geologist; Leonard H. Hussey, meteorologist; R. W. James, physicist and magnetician.

This rescue will remain noteworthy in the annals of Polar exploration. Only the leader's energy and perseverance and the endurance of the marooned party could have turned aside the impending disaster. It is to be hoped that similar good fortune awaits the ten other members of the expedition in the Ross Sea region, who have not been heard from since May 6, 1915.

Return of the Southern Party of the Stefansson Expedition. The arrival of the power schooner *Alaska* on August 15 at Nome, Alaska, with the members of the southern party of the Stefansson expedition on board, was announced in the daily press of August 17. The expedition, it will be recalled, was divided into two parties, the northern, under Stefansson himself, and the southern, under Dr. R. M. Anderson. The fortunes of the northern party were recounted in the July, 1914, and October, 1915, numbers of the *Bulletin of the American Geographical Society.*

The *Alaska* left her two years' station at Bernard Harbor on Dolphin and Union Strait, between Victoria Island and the mainland, on July 13, 1916, and reached Herschel Island off the Mackenzie estuary on July 28. She then proceeded westward along the Alaskan coast and southward to Bering Strait until she reached Nome. The following members of the scientific staff returned on the *Alaska:* Dr. R. M. Anderson, executive head of the southern party, geologist; J. J. O'Neill, geologist; J. R. Cox, topographer; D. Jenness, ethnologist; F. Johansen, naturalist. K. G. Chipman, chief topographer, is returning by way of the Mackenzie River.

The following account of the activities of the party which covered the Arctic mainland coast of Canada from Cape Parry (124° W.) to Bathurst Inlet (108½° W.), is based on a cablegram from Doctor Anderson published in the August 17 issue of the *New York Times.*

During 1915 Chipman and O'Neil made a detailed survey of the coast from the Cape Parry peninsula to Stapylton Bay (116½° W.); from here Cox carried it on as far as the Rae River, at the western head of Coronation Gulf. This hitherto unexplored river was surveyed for about seventy-five miles above its mouth, and a traverse was made overland to Stapylton Bay to ascertain the geology. Later Cox and O'Neil continued eastward along the southern shore of Coronation Gulf, surveying the region about Port Epworth (112½° W.) and the Kogluktualuk (112° W.), a large river with many waterfalls. In August and September the coast east from Cape Barrow (111° W.) around Moore Bay (110⅓°), Arctic Sound, and Hood River (109½°) and part of Bathurst Inlet were surveyed in detail topographically and geologically. These surveys were completed in the spring of 1916 and the remainder of the coast west of Cape Barrow filled in. They will considerably rectify our present maps of the Bathurst Inlet region, which go back to Sir John Franklin's hurried voyage in 1846. For instance, over one hundred and fifty islands were mapped in the region at the western side of the entrance to the inlet, where three large islands, Chapman, Lewis, and Marcet, have heretofore been indicated. The geological investigations, the main work of the party, were very encouraging. In addition to the known occurrences a large new field of native copper was mapped and studied.

Complete meteorological records were kept for three years continuously. Tidal observations were made during the winter in Dolphin and Union Strait, as well as deep-sea dredgings and soundings here and elsewhere. About one thousand specimens of birds and mammals were brought back. Numerous photographs and cinematograph pictures of native life, natural history objects, and scenery were taken.

In ethnology, Jenness did valuable work, some of which is mentioned in the note immediately below. From April to November, 1915, he sledged and packed with the primitive Eskimos in the interior of Victoria Island. Returning over the ice to the mainland, he made extensive ethnological and archeological collections, including one hundred phonograph records of folklore. The manners, customs, and games of the Eskimos were studied.

Doctor Anderson's cablegram also told of the activities of the northern party of the expedition and of Stefansson's plans. The *Mary Sachs* was hauled up on the beach at Cape Kellett, Banks Island, in charge of Captain Bernard and an Eskimo crew for a reserve station. The *North Star* was unable to proceed farther north than a small unnamed island north of Robilliate Island, west of Banks Island, and was also hauled up safely as a base for ice trips. Her crew joined the *Polar Bear's* exploring parties.

The *Polar Bear,* in charge of Stefansson, made an unsuccessful attempt to sail up the west side of Banks Island in 1915. She wintered near Princess Royal Island, Prince of Wales Strait, between Banks and Victoria Islands. The death of several dogs prevented a projected ice trip to Beaufort Sea. But the main work of the party was to be the exploration of the newly discovered land north of Prince Patrick Island (see the October, 1915, *Bull. Amer. Geogr. Soc.,* pp. 766-769). The party left for this trip in May to remain in the field as long as conditions would permit. If the coast of the new land turned southwest and it seemed possible that no land existed in Beaufort Sea within sledging distance of Banks Island or Prince Patrick Island, the party would endeavor to return in 1916. But from the location of the vessels and the scattering of the various parties it is hardly thought probable that the northern party will return this year. The explorers are well supplied for another year or two with staples, which are supplemented by musk-oxen and other game.

Explorations in Victoria Island. Word has been received of the safe return of Mr. Diamond Jenness from Victoria Island after a season's work with the Eskimos. Mr. Jenness is ethnologist of the southern party of the Canadian Arctic Expedition. His plan of work is outlined in a report by Dr. R. M. Anderson (*Summary Rept. Geol. Survey of Canada for 1915,* Ottawa, 1916, pp. 228 and 230). The party started with a family of Eskimos on April 13, 1915, about the time the barren-ground caribou began to migrate in numbers from the mainland across to Victoria Island, and planned to follow the migration north across Wollaston Peninsula (for locations, see map accompanying "Victoria Island and the Surrounding Seas" by Vilhjalmur Stefansson, *Bull. Amer. Geogr. Soc.,* Vol. 45, 1913, pp. 93-106). Thence they were to journey to Lake Tahieryuak in the interior or west-central part of Victoria Island and, after gathering ethnographic material concerning little-known groups of Eskimo, return in the autumn, following the caribou southward.

Though no report other than that in the preceding note is yet available on this latest work, important records may be expected, for Mr. Jenness had already made many trips among the Eskimos of the region. Doctor Anderson reports that Mr. Jenness' studies along the coast in the region of the winter station have resulted in important discoveries in relation to Eskimo migrations, tribal distinctions and limits, customs, and language.

PHYSICAL GEOGRAPHY

A Graphic Record of Weather. A simple method of keeping a graphic record of daily weather has many advantages over the usual written description. Mr. E. T. Quayle, assistant in the Commonwealth Bureau of Meteorology of Australia, has recently described a simple scheme for a graphic record which he has used satisfactorily for over twenty-five years. The record deals chiefly with cloud types and their amounts, movements, and changes, but includes also winds, rain, and electrical and other phenomena. The time (hour of the day) is shown along a horizontal line, and the cloud levels are indicated vertically. The cloud forms are represented as seen in section, or as they would appear on the horizon. The level to which the cloud belongs is indicated by the height of its position on the vertical scale of the diagram. The amount of cloud and its duration are partially suggested by the way the stratum is broken, or by the addition of a figure to show a numerical estimate. The rate of movement may be shown by different amounts of feathering on arrows which show the direction of movement. Wind directions are indicated by arrows at the bottom of the diagram. Rain, lightning, etc., are suggested by conventional symbols or by sketches. Short supplementary notes may be added when necessary. The illustrations of this method of keeping a graphic weather record, given in Mr. Quayle's report, show the value of the scheme in presenting at a glance a vivid and interesting picture of each day's weather (E. T. Quayle: A Graphical Method of Showing the Daily Weather, especially Cloud Types, *Commonwealth Bur. of Meteorol. Bull. 12,* Melbourne, 1916). R. DeC. Ward.

Rainfall Forecasts and Wind Directions. The "patchiness" of rainfall, both as to distribution and amount, in our ordinary cyclones is a well-known fact and one which often makes weather forecasting a difficult matter. Mr. H. H. Clayton, chief of the forecast division of the Argentine Meteorological Office, has approached this difficulty from the forecaster's side and has presented some new and interesting facts. The ascent of air, resulting in rainfall, may be induced by (1) topography; (2) heating at the earth's surface, which determines the formation of local ascending currents resulting in cumulus clouds and local showers; (3) converging or opposing winds, determined by horizontal differences of temperature and pressure. While both (1) and (2) must be kept in mind by the forecaster, the third is the main cause of our ordinary

rains. When winds are diverging, a descent of air and fair weather are indicated. When winds are converging, ascending air is indicated, accompanied by expansion, cooling, and condensation. The intensity of rainfall is determined by (a) the angle of convergence, (b) wind velocity, (c) moisture of the air, (d) topography. Mr. Clayton's method in forecasting is to predict the pressure distribution for the following day, to draw in the inferred wind arrows, and then to locate the areas of converging and of diverging currents. The former are then marked as rainfall districts. When the relative humidity is low (60% or less), rain does not result from converging winds, and the rain areas are there omitted (*Monthly Weather Rev.*, Vol. 44, 1916, pp. 80-81).

R. DEC. WARD.

HUMAN GEOGRAPHY

History and Geography: The Nature of Their Relation. A note of warning against exaggerating the relation between geography and history is sounded by Brunhes in his introduction to the second year's (1913-1914) course in human geography at the Collège de France (Jean Brunhes: La géographie de l'histoire, *Rev. de Géogr. Annuelle,* Vol. 8, 1914-15, pp. 1-71). According to this eminent investigator, all history does not proceed from geography, neither does history always repeat itself when enacted on the same physical stage. In other words the element of period, i. e. of time and of changing conditions, must also prevail. A strictly mathematical interpretation of the influence of geography on history is therefore impossible. The very essence of the relation requires the utmost latitude in its applications. A characteristic custom, facts of a social character, economic or political, for example, can generally be made to fit within geographical frames. Persistence of the relation in time or space, however, does not necessarily ensue. The mistake that is often made consists in an attempt to prove the continuity of interactions which in reality are exceedingly variable in character.

To illustrate Brunhes's idea, mention may be made of the minarets in Bosnia-Herzegovina, cited by him. Bosnia is a well-forested region, while Herzegovina is characterized by broad plateaus of bare limestone. Wooden minarets prevail in the former province. In the latter they are built of stone. We have here differences evidently due to geography. But the influence of the land does not end with the material used in the construction of minarets. The shape or rather the type of minaret is also determined by this material. The wooden minaret ends in the form of a circular terrace roofed over by a wooden reproduction of an enlarged Malaysian hat. In the stone minaret the balcony is placed as a ring at mid-height, the structure being prolonged shaft-like to taper into a point.

It would appear at first glance as if the relation ended here. Nevertheless in recent years the stone minaret tends to replace its wooden variety of type throughout richly wooded Bosnia. The change is economic and based on human experience. The stone structure has been found to be more enduring. It is less subject to destruction by fire, and the deterioration due to rain is trifling. Therefore in all the large cities of the wooded belt—Sarayevo and Jajce are given as examples—the minarets of recently built mosques are built of stone. The course of normal evolution in geographical influences is suggested by this example of the transition from a blind to an intelligent response to environment, the latter term being taken in the sense of a constantly broadening field as man's conquest of distance and of transportation facilities becomes more thorough.

GEOGRAPHICAL NEWS

The Physiographic Committee of the U. S. Geological Survey. Through the courtesy of the Director of the U. S. Geological Survey, we are now able to amplify the brief announcement made in the February *Review* (p. 367) to the attention henceforth to be paid to physiography by the Survey in its work. The Chief Geologist, David White, recently made provision for the utilization of physiographic work done in connection with geologic investigations and for the directing and systematizing of physiographic research generally by a standing committee. For this purpose the Physiographic Committee, which has been in existence for several years, has been reorganized and given definite duties. It now consists of the following members: M. R. Campbell, Chairman, F. E. Matthes, O. E. Meinzer, E. W. Shaw, and Philip S. Smith. Its duties, as outlined by the Chief Geologist, are:

(1) To read and pass critically and advisorily upon physiographic papers or physiographic chapters or sections in other papers submitted for publication by the Survey.

(2) To consider the classification and nomenclature of physiographic provinces.

(3) To prepare or make recommendations for the preparation of physiographic descriptions, in popular language, to be printed on the backs of topographic maps.

(4) To consult with geologists regarding the solution of physiographic problems.

(5) To formulate the usage of physiographic terms, in continuance of the work of the old committee.

(6) To confer with chiefs of section and with the Chief Geologist regarding physiographic work to be undertaken by the Survey.

It is to be hoped that physiographers and geologists throughout the country will confer freely with the committee upon any subject that may properly come within its sphere of activities, but especially regarding uniformity of usage and greater exactness of definition of physiographic terms. The committee expects to take up, from time to time, as opportunity offers, those terms which have been used loosely or used in more than one sense, and to endeavor to formulate definitions which will be acceptable to the majority of physiographers. In framing these definitions special weight will be given to the following factors: (1) etymology and literal meaning of the word, (2) priority of use, (3) currency of use, (4) avoidance of the use of more than one word to express a single idea, (5) avoidance of the use of any word in more than one sense, and (6) exactness of definition, especially in delimiting features or processes which are closely related or which merge one with another.

After the definitions have received the provisional approval of the committee, it is proposed to send copies of the argument and decision to physiographers and geologists of recognized authority for their consideration. If the decision is generally approved, the findings of the committee will doubtless be adopted by the Geological Survey, but, should there be much disagreement, the committee will reconsider the question.

It is hoped by this procedure to determine the best usage, to make definitions more exact and unequivocal, and to secure greater uniformity of usage, not only in the Geological Survey but also among physiographers and geologists outside of that organization.

Personal

Dr. Charles C. Adams has been appointed to the professorship of forest zoölogy in the newly formed department of zoölogy at the New York State College of Forestry of Syracuse University.

Prof. Edward W Berry of the geological department of Johns Hopkins University has been doing work in Mississippi and Texas for the U. S. Geological Survey during the summer.

Mr. William Bowie of the U. S. Coast and Geodetic Survey has recently been appointed a member of the United States Permanent Commission of the International Geodetic Association.

Mr. Carl Cheswell Forsaith has been awarded the second Walker Prize, offered by the Boston Society of Natural History, for his essay on "The Relation of Peat Deposits to the Formation of Coal."

Dr. William H. Holmes, chief of the Bureau of American Ethnology, has been made Corresponding Associate of the Academia Nacional de Historia of Colombia.

Dr. Aleš Hrdlička of the United States National Museum has been made Corresponding Associate of the Academia Nacional de Historia of Colombia.

Dr. Otto Klotz, Dominion Astronomer, Ottawa, received the honorary degree of Doctor of Laws at the commencement of the University of Pittsburgh in June.

Prof. E. M. Lehnerts of the department of geography of the University of Minnesota has succeeded D. Lange as president of the Minnesota Forestry Association.

Prof. B. E. Livingston of the department of botany of Johns Hopkins University read a paper on "A Quarter-Century of Growth in Plant Physiology" at the quarter-centennial celebration held at the University of Chicago, June 2-6.

Dr. F. J. H. Merrill, from 1899 until 1904 state geologist of New York, has moved to Los Angeles, where he will resume consultant practice in geology and mining engineering.

GEOGRAPHICAL PUBLICATIONS

(Reviews and Titles of Books, Papers, and Maps)

For key to classification see "Explanatory Note" in the July number, pp. 77-81

NORTH AMERICA

United States

North Atlantic States

McIlwain, C. H., edit. **An abridgment of the Indian affairs, contained in four folio volumes, transacted in the colony of New York, from the year 1678 to the year 1751, by Peter Wraxall.** xxxiv and 251 pp. (Harvard Historical Studies, Vol. 21.) Harvard University Press, Cambridge, 1915. $1.80. 9 x 6.

Indian affairs between 1678 and 1751 were based largely on trade in beaver pelts, and the extermination of the beavers in the neighborhood of the settlements extended the trade into remote and foreign territories with consequent international complications. It appears that it was not a demand for beaver furs that inspired the trade between the colonies and the Indians but rather a desire for trade by means of which a political alliance with the Indian tribes might be attained. The record of thousands of skins burned so as not to glut the market is significant. The competition for Indian trade lay between the French and the English and, as English goods were cheaper than the French, the Indians could get twice as much for the skins at both Albany and Oswego as they received at any of the French posts. Because the center of distribution of the English goods lay directly in the Iroquois country, the Iroquois were easily won to an alliance, and later, when the trade was extended, they became the middlemen between the distant Indian tribes and the English. The fur trade was America's great conservation problem of the eighteenth century, but there was no conservation of beaver and no effective regulation of trade, mostly, no doubt, because of political motives. The records of the dealings with the Indians have, even for a reader of this day, very familiar phrases which can be traced to their similarities to "dollar diplomacy." At the same time the "eagerness to engross the trade" of the Indians probably led to more flagrant evasions of law and order than can be charged against the American people since.

Such in brief is the story of this book. The editor in the first 110 pages explains the background of the records, furnishes the reader with accounts of the early fur trade in the north and south and especially in New York, shows the attempts at the regulation of the fur trade, and adds a history of the New York Indian records and a brief sketch of Wraxall. Then follows (250 pages) a copy of the abridgment of the New York Indian records. Robert M. Brown.

Abbott, A. P. **The Hudson River today and yesterday.** 85 pp.; map, ills. Historian Publ. Co., New York, 1915. 7½ x 5. [Good panoramic views of both banks. Text not free from inaccuracies, e. g. concerning origin of "Spuyten Duyvil."]

Cleland, H. F. **Geological excursions in the vicinity of Williams College.** 67 pp.; maps, diagrs., bibliogr. Williamstown, Mass., 1916. 7½ x 5.

Johnson, Clifton. **Highways and byways of New England.** (Series: American Highways and Byways.) xii and 299 pp. The Macmillan Co., New York, 1915. $1.50. 8 x 5. [Homely bits of local color.]

Landreth, O. H. **Water resources of New York state.** *Journ. of the New York State Forestry Assoc.*, Vol. 2, 1915, No. 4, pp. 17-19 and 48. Syracuse, N. Y.

Middleton, James. **New York, the stupendous.** Ills. *World's Work*, Vol. 31, 1916, No. 5, pp. 538-554. [The population of the political entity known as New York exceeds by a million that of the political entity known as London.]

Newland, D. H. **The quarry materials of New York—granite, gneiss, trap and marble.** 212 pp.; maps, diagrs., ills., index. *New York State Museum Bull. No. 181.* Albany, 1916.

—— **New York's advantages as a free port.** Map, ills. *Dun's Rev.: Internatl. Edit.*, 1916, May, pp. 35-38. [Urges the establishment of a free zone near the city.]

PERKINS, G. W. **The Palisades Interstate Park.** Ills. *Amer. Museum Journ.*, Vol. 16, 1916, No. 3, pp. 201-207. [Notes from an address before the members of the American Scenic and Historic Preservation Society and the American Museum of Natural History, Jan. 21, 1916.]

STOLLER, J. H. **Glacial geology of the Saratoga quadrangle.** 50 pp.; maps, diagrs., ills., index. *New York State Museum Bull. No. 183.* Albany, 1916. [With geological map, 1:62,500, of the Saratoga quadrangle.]

STRUNSKY, SIMEON. **The city's ragged edges.** Ills. *Harper's Mag.*, No. 789, Vol. 132, 1916, Feb., pp. 436-447. [Bright sketch, with pleasing illustrations, of what Baedeker's "United States" fittingly terms "the unkempt environs of New York."]

—— ***Chateaugay, New York, sheet.*** [***Topographic map of the United States.***] 1:62,500. Surveyed in 1912-1913; edition of Sept., 1916. U. S. Geological Survey, Washington, D. C. [Chateaugay chasm is a good example of a young stream valley carved since the Glacial Period by a river forced out of its former course by the ice. The absence of roads and abundance of forests in the southern, mountainous part of the map is in strong contrast with the frequent roads and prevalence of cleared lands on the plains to the north.—D. W. J.]

EUROPE

GENERAL

BENEZET, L. P. **The story of the map of Europe: Its making and its changing.** (Series: The Lake History Stories.) 277 pp.; maps, ills., index. Scott, Foresman & Co., New York [1916]. 60 cents. 7½ x 5. [Vivid survey of the history of Europe from its beginnings to January, 1916, with emphasis on racial and nationalistic phases. The book is intelligible to grammar-school pupils, without losing in acceptability for adults, because of its sustained interest and fascinating style. There are numerous ethnographic maps and maps of territorial changes: these would gain in value by being correct in geometrical outline.]

COOPLAND, G. W. **The Franco-Belgian frontier.** *Geogr. Teacher*, No. 44, Vol. 8, 1916, Part 4, pp. 266-270.

LAMERS, J. M. **De posterijen, telegrafie en telefonie tijdens den Europeeschen oorlog.** *Vragen van den Dag*, Vol. 31, 1916, No. 4, pp. 257-277. Amsterdam.

SPICER, E. C. **The French and German borderlands.** Maps, diagr., bibliogr. *Geogr. Teacher*, No. 44, Vol. 8, 1916, Part 4, pp. 260-266.

WARD, R. DEC. **The weather factor in the great war, III: May to October, 1915.** *Journ. of Geogr.*, Vol. 14, 1915-16, No. 3, pp. 71-76. [The third article in a series of which the first two were published in *Pop. Sci. Monthly*, Dec., 1914, and *Journ. of Geogr.*, Feb. and March, 1915.]

SCANDINAVIA, INCLUDING FINLAND

DRACHMANN, POVL. **The industrial development and commercial policies of the three Scandinavian countries.** Edited by Harald Westergaard. 124 pp,; index. Issued for the Division of Economics and History of the Carnegie Endowment for International Peace by the Clarendon Press, Oxford, 1915. 10 x 7.

The present volume is one in a series of investigations conducted by the Carnegie Endowment in order to ascertain the economic causes and results of war. Yet it does not confine itself to this subject. In convincing form and within small compass it gives an excellent review of the splendid economic development that has taken place in Scandinavia since the middle of the last century, when the three countries recovered from the effects of the Napoleonic wars. Through the efforts of the heath reclamation society the soil of Denmark has been brought under cultivation to an increasing degree until it is estimated that only four per cent of the total acreage is untillable. Various associations with state support have brought farming up to the highest point of efficiency. Though Denmark is distinguished for a few manufacturing industries requiring a high degree of technical or artistic skill, such as the famous oil-burning Diesel motor ships and the beautiful porcelain, the country still remains an agricultural state, but agriculture itself has been industrialized by the co-operative slaughter-houses and dairies.

In Norway and Sweden the recent extraordinary growth of manufacturing has brought the countries face to face with the problem of how to keep the natural resources in the hands of the people, a problem that is the more acute since it is largely foreign capital that is invested. Norway in 1909 passed a drastic concession law, which seeks to guard

the interests of native labor and capital. Its most important clause is that fixing the time limit of the concession of the right to utilize any waterfall of over one thousand horse-power at from sixty to eighty years. After that time the waterfall and power-station with machinery revert without compensation to the state. The law has not yet been in force long enough to judge of its effects. The government of Sweden itself owns and has developed important waterfalls, including that of Trollhättan with 80,000 horse-power and Porjus with 50,000. The state has a contract with the Grängesberg company which owns or controls most of the Swedish ore mines. By this one half of the net profits of the mines will accrue to the people of Sweden after the year 1932, and the government reserves to itself the right to take them over entirely at a reasonable price. The production up to that time is limited by a government regulation. HANNA ASTRUP LARSEN.

HAMBERG, H. E. **Grandeur de la variation diurne de la température dans la péninsule Scandinave.** 71 pp.; maps. *Bihang till Meteorologiska Iakttagelser i Sverige,* Vol. 54, 1912. Upsala, 1914.

We have too many publications filled with tabulated meteorological and climatic data, and too few discussions of these data. Norway and Sweden have long been doing admirable meteorological work, of an intensive character, and this latest publication is a worthy successor to the many notable contributions to meteorology which have preceded it. Doctor Hamberg's excellent monograph is a type of discussion which ought to be available for many other countries. We have, in this report, a very careful study of the diurnal range of temperature in the Scandinavian peninsula. For Upsala the period of hourly temperature observations is a long one (1866-1910), and for Vassijaure, in Lapland, such observations have been made since July, 1905. Where hourly observations are not available, the periodic diurnal range has been calculated by means of a method suggested by Rubenson in 1876, using the 8 A. M., 2 and 9 P. M. readings. The non-periodic diurnal range, as is generally known, is readily obtained from the readings of the maximum and minimum thermometers. The controls of the diurnal range of temperature, especially the cloudiness, are discussed, and a large number of charts illustrate the monthly distribution of the periodic diurnal ranges and of the periodic diurnal minima. Doctor Hemberg's monograph is too detailed for general reading, but for those who are making a special study of the temperatures of Norway and Sweden and for those who want to know how much of interest and of meteorological importance there is in the diurnal ranges of temperature, this report may be recommended for careful study.

R. DEC. WARD.

—— **Finland, trade of, Report for the year 1914 on the.** 43 pp.; map. *Diplomatic and Consular Repts.,* Ann. Series, No. 5546. London, 1916.

HARTMANN, JULIO. **Memoria annual del cónsul general de Chile en Noruega correspondiente a 1914.** *Bol. de Relaciones Exteriores,* No. 59, 1915, August, pp. 81-98. Santiago, Chile.

JOHANSEN, A. C. **Fünfter Bericht über die Pleuronectiden in der Ostsee.** 104 pp.; maps, diagr., ills. *Rapports et Procès-Verbaux des Réunions, Conseil. Perman. Internat. pour l'Expl. de la Mer: Rapports,* Vol. 22, Art. 2. Copenhagen, 1915. [On the flounders, soles, and similar flat fishes of the Baltic.]

STÖRMER, CARL. **Preliminary report on the results of the aurora-borealis expedition to Bossekop in the spring of 1913 (Third communication).** Maps, diagrs., ills. *Terrestr. Magnet. and Atmospher. Electr.,* Vol. 20, 1915, No. 4, pp. 159-174.

—— ***Finland, Geologisk öfversiktskarta öfver: Sekt. D3, Joensuu.*** 1:400,000. Geologiska Kommission, Helsingfors, 1910.

—— ***Norge, Topografisk kart over kongeriket: Voss sheet.*** 1:100,000. Surveyed in 1861-1865, revised in 1885 and 1911. Norges Geografiske Opmaaling, Christiania, 1888; new edition, 1914. [A beautiful example of the cartographic art for which the Norwegian survey is justly famed, showing with special clearness many of the features of alpine glacial erosion in southern Norway. The sharply incised glacial troughs and glacial notches cut across preglacial divides are particularly interesting.—D. W. J.]

SPAIN, PORTUGAL

BELL, F. G. **Portugal of the Portuguese.** x and 268 pp.; map, ills., index. Charles Scribner's Sons, New York, 1915. 7½ x 5½.

Statements of the customs and religion of a people, descriptions of buildings, essays on literature and historical surveys, all are interesting information to one seeking knowledge concerning any country, but the general run of readers, consciously or unconsciously, prefers a connected story and an elucidation of the character and life of the people.

Now and then a casual reference to sunny skies and irregular topography shows that some geographic relationships could not escape observation, but as a whole this story of Portugal follows a too common style of pure description and is wanting in the deeper study of the principles of national life. While the author devotes a page to climate, the physical environment is as a rule neglected. The book is freely punctuated with foreign names and phrases even at times when the English translation is more expressive. However, it covers a remarkable range of topics and offers glimpses into many corners of the republic, infrequently referred to by most writers. Since Portugal's turn from monarchy to republic is still an overshadowing element in the life of her inhabitants, it is natural that a large share of any story of this country should be devoted to its recent history and politics, the gravity and far-reaching effect of current political changes, and a semi-prophetic glimpse into the future. ROBERT M. BROWN.

BELTRAN Y ROZPIDE, RICARDO. **Geografía: Guía y plan para su estudio, con especial aplicación á la geografía económica. Part I: Preliminares; La península Española.** 147 pp. Imprenta del Patronato de Huérfanos de los Cuerpos de Intendencia é Intervención Militares, Madrid, 1915. 6½ x 4½.

In the prologue to this volume the author discusses the concept of modern geography, whose content he describes as "study of the earth as the theater of organic, in particular human, life." He re-enforces his concept with quotations from the writings of Davis, Huntington (see *Bull. Amer. Geogr. Soc.*, Vol. 45, 1913, pp. 641-652), and Tower (*Bull. Amer. Geogr. Soc.*, Vol. 40, pp. 522-530; Vol. 42, pp. 801-825). Method is discussed shortly, and the remainder of the first part of the projected work is devoted to the Iberian Peninsula. It is treated on a regional basis, emphasis being laid on the economic unit.

HERNÁNDEZ-PACHECO, EDUARDO, AND J. D. CERECEDA. **Geología y paleontología del Mioceno de Palencia.** 289 pp.; maps, diagrs., ills., index. *Comis. de Investigac. Paleontológ. y Prehist. Mem. No. 5.* Inst. Nacional de Ciencias Físico-Naturales, Madrid, 1915. [Sections on the physical geography of the Tertiary basin of the Duero and on the geology of the Palencia region north of Valladolid. Summary in French.]

LOWRIE, W. L. **Portugal.** 7 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 11a. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

AFRICA

SUDAN AND UPPER GUINEA

FRIEDLAENDER, IMMANUEL. **Beiträge zur Kenntnis der Kapverdischen Inseln: Die Ergebnisse einer Studienreise im Sommer 1912.** xii and 109 pp.; maps, ills. D. Reimer (E. Vohsen), Berlin, 1913. Mk. 15. 10 x 8½.

Means of getting about the Cape Verde Islands are indifferent; so Doctor Friedlaender, who hired a schooner in the summer of 1912 and spent over four months in their exploration, assures us he is the only traveler who has visited all of them.

The islands have no economic significance apart from the coaling depot and trans-Atlantic cable station at São Vicente. Six million tons of shipping called there in 1913, and nine cables land there. One of these days the steamers will burn oil, and a great Marconi station is soon to be erected there. Then what will become of São Vicente?

The reader gets a picture of an easily existing, tropical folk, kindly and courteous, not unhappy in good days nor impatient in bad ones, prolific in offspring, but of low initiative and negligent in matters of morals and sanitation. Leprosy, malaria, and dysentery are common. Negligence in protection of drinking water is extreme. Consumption is rife among the dust-breathing coal heavers, who sleep too many persons in a room, and among the negroes, owing to the practice of wearing clothes that white merchants and clergymen have taught them but that are not suited to the climate and their nature!

Most of the islands suffer from aridity, yet the actual water supplies are not nearly utilized. Short rains bring calamity by famine. In 1903, 22,000 people died of hunger. The main food is maize. Tropical fruits can be easily raised and are cultivated to some extent. Sugar cane does well but is too largely made into rum. Drunkenness follows and tuberculosis. Products of great merit are coffee, fetching the highest price at Lisbon, and *pulgueira,* a plant yielding a lubricating oil that is in great demand at Marseilles. But neither is produced in important amount. And, indeed, why work? Ninety-seven people to a square mile and many miles of stony lavas and ashes, and more of them waterless, suggest ease of life. Of 144,000 inhabitants four per cent are white and sixty-six per cent mulattoes, according to the Statesman's Year Book.

Formerly there were important whale fisheries. Now the whales are gone from that neighborhood. Many of the men are still famous whalers, especially from the island of Fogo, but they work for American ships, and this has brought about much emigration from Fogo to the United States, especially to "the little cities New Bredford [*sic*] and Providence, which are mostly inhabited by former Cape Verde folks!" It is of interest to note that the inhabitants of Fogo are nearly all *black!*

The book is sketchy and has practically no meteorology. It has many maps, which only claim to be improvements on previous bad ones from the author's passing observations. But it is readable and an excellent volume on the Cape Verdes.

MARK JEFFERSON.

LEZZI, ERNESTO. **Alcuni dati sul commercio della Nigeria.** *L'Africa Ital.*, Vol. 35, 1916, No. 2, pp. 33-46. Naples.

—— **Nigeria, Colony & Protectorate of, Blue Book, 1914.** 815 pp. Lagos, 1915. [Sections on meteorology, population, agriculture, transportation, and commerce.]

—— **Sudan Almanac, 1916; compiled in the Intelligence Department, Cairo.** 108 pp., diagrs. London. 5½ x 4.

ASIA

MONGOLIA, CHINESE TURKESTAN, TIBET

GRÖBER, PAUL. **Der südliche Tiën-Schan.** vi and 104 pp., maps, diagrs., ills. *Geogr. Abhandlungen*, herausgegeben von Albrecht Penck, Vol. 10, 1914, No. 1. B. G. Teubner, Leipzig and Berlin.

This monograph treats of a marginal part of the Tian Shan, northeast of Kashgar and adjoining the desert basin of Central Asia. It includes a mountain range, of strong relief, the Kara-Teke-Tagh, but of so complicated form as to elude reduction to a brief statement; a series of aggraded intermont basins next south; and two enclosing monoclinal ranges nearly buried in desert deposits.

Students of geography must wish every success to the daughter science of geology, which in the last century outgrew its old mother; but they may be excused if they at the same time regret to see geology taking the leading part in a "book" where geography has the title rôle. The monograph under review is a case in point. A thoroughgoing geological description of the area studied occupies the first sixty-eight pages, which bear every mark of professional competence; they include without hesitation or excuse an abundance of advanced technical terms, such as *Blattverschiebung*, *Oberkarbonisch*, and *Fusulina cylindrica;* and they close with nine pages of summary and eight pages of generalizations that seem to demand for their clear understanding about as much thoughtful effort on the part of the geographical reader as their preparation must have required on the part of their geological author, for it is extremely difficult to visualize the special relations of all the items of distribution, structure, and history therein contained. When it comes to geography, only twelve pages are allowed to an account of the orographical features, six to comments on previously published maps, three to precipitation, eight to the age and position of surface forms and to climatic variations (much of the latter topic being geological), and five final pages to lines of travel.

The geological pages are not considered here. An examination of the twelve pages explicitly devoted to orography makes it evident that to their author geographical problems were secondary to geological in the way of home preparation, of field study, and of subsequent presentation. Topographical descriptions are partly placed on the pages devoted to orographical features, partly on those alloted to the age (not stage) of surface forms. The method of description is variable, as is the case in many undisciplined geographical articles today; and this is as if a mineralogist should describe one specimen according to an ancient system of classification and another according to a modern system. Descriptive terms are sometimes empirical, sometimes explanatory. Technical geographical terms are not abundant, and so familiar a one as *Jugendstadium* is placed in quotation marks as if it were something of a stranger. The unwary reader may be puzzled on finding three different terms used for one and the same thing; for a certain range is described on one page as including belts of weak strata, in which *Längstäler* have been excavated, and on other pages the same valleys are called *Nachfolgetäler* and *Isoklinaltäler*. *Inselberg* is not used for a residual mountain in the sense given by Bornhardt and other German writers on Central Africa but for a mountain that is partly buried in superficial deposits. Many structural items, such as the dip of strata, that are essential in understanding orographic features, are omitted from the lines on the geographical pages where they would be helpful. They

may perhaps be announced elsewhere. Sixteen diagrams and sections illustrate the sixty-eight pages of geological text; the location of the sections is unfortunately not shown on the accompanying maps. No diagrams are included in the geographical pages where they are greatly needed; two small landscape sketches are included with the geological sections, but no reference to them is made in the geographical pages. Some good half-tone plates follow the text, but as they bear no reference to the text pages on which they are described, and as few of them are cited in the text, their value is much depreciated. The refolded sheets of maps are of much value, though the style of the text makes reference to the maps laborious.

The reader of this review may wish that it might uncomplainingly tell more of the things described and less of the style of the descriptions. The reviewer's reply must be that he has set forth the chief impressions he has received from several hours' examination of Gröber's monograph. It is so difficult to work over, and digest, and abstract the real geographical essence from pages that are so geologically redundant and geographically unsystematic that the time reasonably allotted to their reading has passed without more geographical product than is here set forth. Reading should be plain sailing, but here it is exploration. Even so elementary an aid to the reader as page headings and frequent paragraph headings are wanting. It would not seem a difficult matter to describe the geographical features of the enclosing monoclinal ranges with their long subsequent valleys, above referred to; but instead of holding to this task and completing it the text too often takes a crossover from a geographical to a geological track in such phrases as "die überschobenen Schollen des oberkarbonischen Kalkes." One intermont basin is briefly described as filled with loess, in which gravelly *wadies* are incised; perhaps that is enough, but if the geographical treatment were on a par with the geological, much more would be said.

Like all the other numbers of Penck's *Geographische Abhandlungen,* this one is a learned and a faithful work and its pages redound to the credit of its author as a geologist; but geographically considered they leave much to be desired. If geology were a struggling young science, one would not begrudge the space here given to its profit; but geology is vigorous and thriving; it is geography that is struggling to become a science. Hence one must regret that the director of a leading geographical institute should divert to another science, already flourishing, so many pages of a leading geographical publication from the needy subject for which he is professionally responsible.
W. M. Davis.

—— **Indo-Yarkand Trade.** *Board of Trade Journ.*, No. 1,004, Vol. 92, 1916, pp. 544-546.

Vissière, A. **Nouvelles divisions politiques de la Mongolie.** *La Géogr.*, Vol. 30, 1914-15, No. 5, pp. 376-379. Paris.

White, J. C. **The world's strangest capital.** Ills. *Natl. Geogr. Mag.*, Vol. 29, 1916, No. 3, pp. 273-295. [Lhasa.]

AUSTRALASIA AND OCEANIA

Australia, New Zealand

Mills, R. C. **The colonization of Australia (1829-42): The Wakefield experiment in empire building.** xx and 363 pp.; index, bibliogr. Sidgwick & Jackson, Ltd., London, 1915. 9 x 6.

This thesis, "approved for the Degree of Doctor of Science (Economics), in the University of London," is "an account of the Wakefield system of colonization . . . . in its effect upon Australian colonization." Inasmuch as Wakefield's theory was first successfully tried in Canada, a brief account of settlement in this American colony is included. The work of Wakefield is traced from 1829 to the practical completion of his efforts in Australian colonization in 1842.

It seems that England began its colonial expansion with considerable indifference toward the accession of territory and its subsequent settlement and development. Wakefield, whose early life had been marked by about three years' imprisonment, left prison with a determination to accomplish something for the masses and thus remove the cloud over his name. The possibility of securing Australia as a colony without any serious opposition by foreign powers gave him his opportunity. Through his indomitable will, perseverance, and ability to handle men tactfully and shrewdly his manœuvers were crowned with great success.

Some of his keenness is exhibited by the following argument, which he advanced when endeavoring to convince his hearers of the folly of colonizing with men only:—"You may make a colony agreeable to men, but not to women; you cannot make it

agreeable to women without being agreeable to men. You may induce some men of the higher classes to emigrate without inducing the women; but if you succeed with the women you are sure not to fail with the men.''

As chief advisor of Lord Durham, Governor-General of the North American Colonies, he put into effect his colonial policy of ''responsible government as the best thing for the colony.'' Apparently this was Durham's policy. Had it been known to the powers in England that it really was Wakefield's, it might not have fared so well. Later, English statesmen agreed ''that colonies of a homogeneous character should . . . . be granted responsible government.'' This represents the culmination of the work of a man who was never allowed to hold public office, yet whose genius could not be supplanted.

A ''select bibliography'' completes this scholarly and highly illuminating treatment of a difficult subject. EUGENE VAN CLEEF.

MAITLAND, A. G. **The geology of Western Australia.** Map, bibliogr. *Geol. Surv. of Western Australia Bull. No. 64,* pp. 79-91. Perth, 1915. [''Written for the Australian visit of the British Association for the Advancement of Science, 1914, and for a general account of the geology of the mining fields of the state.'']

MAITLAND, A. G. **The mining fields of Western Australia.** Maps, diagrs. *Geol. Surv. of Western Australia Bull. No. 64,* pp. 92-105. Perth, 1915.

—— **Queensland, the state of, Statistics of, for the year 1914. Part 1-A: Population.** 13 pp. Govt. Statistician's office, Brisbane, 1915.

TRIVETT, J. B., Government Statistician, comp. **Official Year Book of New South Wales, 1914.** 1,010 pp.; maps, index. [Bureau of Statistics], Government of New South Wales [Sydney], 1915. 10 x 6½. [Sections on ''geography,'' climate, population, mining, commerce, manufacturing, agriculture, irrigation, pastoral and dairying industries, forestry, fisheries, railroads. The geographical section is somewhat of an enumerational nature, describing, one by one, inlets, headlands, islands, rivers, lakes, etc. A map of the land divisions of the state shows the westernmost extension of profitable wheat growing in 1904 and 1912 and the western limit of ten-inch rainfall during the wheat-growing period (April to Oct., inclusive). There are also a map showing mineral deposits and one showing railroads, and a plan of Sydney. This plan, although affecting the appearance of a map, i. e. a representation of features on the ground in their true geometrical relationships, indulges in the reprehensible practice —when not patent—of representing them in bird's-eye view perspective, so that parallel streets are here shown to converge and rectangular blocks appear as rhomboids.]

MELANESIA, MICRONESIA, POLYNESIA

MACCAUGHEY, VAUGHAN. **The forests of the Hawaiian Islands.** Ills. *Plant World,* Vol. 20, 1916, No. 6, pp. 162-166.

The outstanding feature of Hawaiian flora is its endemic character: ''there is no other region of equal area in the world that possesses so large a proportion of peculiar and endemic plant species.'' Classification of the forests rests primarily upon the twofold basis of altitude and exposure. The island peaks rise to heights of 3,000 to 14,000 feet, and the leeward and windward sides are sharply differentiated as regards precipitation. Commercially the most important belt of woodland is that termed ''middle forest zone,'' occupying elevations between 1,800 and 5,000 feet and characterized by the species *ohia* and the ''Hawaiian mahogany,'' *koa.* The introduction of mesquite into the arid lowlands has had important economic results. It affords valuable cattle food and is also used locally as firewood. As a protective covering on the watersheds the native forest is perhaps of the greatest significance.

ANDREWS, E. C. **Relations of coral reefs to crust movements in the Fiji Islands.** Map. *Amer. Journ. of Sci.,* No. 241, Vol. 41, 1916, pp. 135-141.

ELIOT, E. C. **A model protectorate: Gilbert and Ellice Islands, Central Pacific.** *United Empire,* Vol. 6, N. S., 1915, No. 12, pp. 878-882.

LARRISON, G. K. **Water resources of Hawaii, 1913.** 190 pp.; index. *U. S. Geol. Surv. Water-Supply Paper 373.* Washington, 1915.

MAYER, A. G. **Papua, where the stone-age lingers.** Ills. *Scientific Monthly,* Vol. 1, 1915, No. 2, pp. 105-123.

MACCAUGHEY, VAUGHAN. **The woods of Hawaii: Notes on the most important varieties, and their economic value.** Ills. *Scientific American Suppl.,* No. 2098, Vol. 81, 1916, Mar. 18, pp. 184-185. [See, above, review of related paper by same author.]

POWERS, SIDNEY. **Explosive ejectamenta of Kilauea.** Map, ills. *Amer. Journ. of Sci.*, No. 243, Vol. 41, 1916, pp. 227-244.

[—— ***Hawaii, Topographic map of*]: *Honomu sheet.*** 1:62,500. Surveyed in 1911-1912; edition of July, 1915. U. S. Geological Survey, Washington, D. C. [Northeast slope of Hawaii, showing excellent illustration of radial consequent drainage characteristic of slope of a young volcano.—D. W. J.]

[—— ***Hawaii, Topographic map of*]: *Kohala sheet.*** 1:62,500. Surveyed in 1911 and 1913; edition of 1916. U. S. Geological Survey, Washington, D. C. [Northern extremity of Hawaii, showing radial drainage of young volcano and excellent examples of small parasitic cones with craters and crater lakes, apparently aligned upon a single extended NW-SE fissure.—D. W. J.]

[—— ***Hawaii, Topographic map of*]: *Waipio sheet.*** 1:62,500. Surveyed in 1911-1913, edition of 1916. U. S. Geological Survey, Washington, D. C. [Striking representation of wave-cliffed volcano and of young valleys eating into volcano flank by rapid headward erosion. Small deltas have formed at mouths of streams which descend cliff face from hanging valleys resulting from rapid wave erosion. Other streams descend from lateral valleys hanging more than 2,000 feet above flat-floored, open main valleys, an abnormal relation that perhaps may be explained by a partial submergence and filling of main valleys which are in reality young.—D. W. J.]

POLAR REGIONS

ARCTIC

MIKKELSEN, EJNAR. **Notes on the sea-ice along the east coast of Greenland. (Alabama-Ekspeditionen til Nordøst-Grønland, 1909-1912.)** Map. Reprint from *Meddelelser om Grønland*, Vol. 52, pp. 187-213. Copenhagen, 1915.

Co-ordinating his own experience with that of two previous expeditions, Mikkelsen finds that for the eight years 1905 to 1912, excepting 1907, a belt of coast water, from a half mile to four miles wide, extended along the east coast of Greenland, comparatively free from drifting ice in early summer but, in June or July, likely to be filled with ice floes either from the land ice or from the pack ice to the east. He thinks it permissible to infer that, with ordinary ice conditions, this belt of coast water is found in summer from Ile de France (77⅔° N.) in the north to the southern part of eastern Greenland.

This coast water, forming the boundary between the solid land ice and the drifting pack ice, probably marks, at its eastern edge, the western termination of the polar current, as all ice outside the coast water drifts to the south whatever the direction of the wind. Farther north there seems to be proof of the existence of a branch of the main polar current close to the northeastern coast of Greenland; for much driftwood is found in Danmark Fiord, on the coast of Holm and Amdrup Lands, and along the north coast of Germania Land. A part of this current sweeps southward through the channel between Shannon Island and the mainland; and Shannon Island is thus encircled by the polar current, which causes the stretch of open coast water to the south.

On the accompanying map the author shows the average outer limits of the pack ice in the five months April to August, when sealers and others are in those waters; also the régime of the polar current and the Gulf Stream as far as they have been observed.

The predominant winds on the east coast are from the north, and their tendency is to close up the pack ice, especially during the summer; southerly winds as a rule open up the pack ice and set it away from the land. The pack ice has received all the more attention because it has often been difficult for vessels to pass through it to the Greenland coast. Captain Mikkelsen summarizes data concerning it collected since 1894 by the Meteorological Institute of Copenhagen. The pack ice off the east coast has an average breadth of about two hundred miles. It is continually moving from north to south at an average rate of about 6.5 miles a day, with extremes noted of between 23 and 3.2 miles a day. The drift on an ice floe of the *Hansa* crew, after their vessel was crushed in the ice in 1869, was at the rate of only 3.2 miles a day; but a part of this drift was in winter and near the land. Many vessels caught in the pack ice have been carried south from four to five hundred miles.

The pack-ice belt, as shown on the map, is widest in April and narrowest in August. The narrowing of the belt is small between April and May, larger between May and June, greatest between June and July, and smaller between July and August. There is a large body of stationary ice over Belgica Shoal, discovered by the Duke of Orleans expedition of 1905, supposed to be formed by masses of ice that are frozen to the floes and icebergs grounded on the shoal.

CYRUS C. ADAMS.

Bouchtejew, A. M. **Les Marées de la Mer Glaciale de Sibérie, observées par l'Expedition Polaire Russe en 1900-1903: II.** *Bull. de l'Acad. Impér. des Sci.* [*de Pétrograde*], 1914, No. 13, pp. 889-892. [In Russian.]

Hoel, Adolf. **D'où vient le renne du Spitsberg?** Ills. *La Géogr.*, Vol. 30, 1914-15, No. 6, pp. 443-448. [Evidence points to a migration of reindeer from Nova Zembla via Franz-Josef Land to Spitzbergen.]

M—, B. W. **The Copper Eskimo.** *Univ. of Pennsylvania Museum Journ.*, Vol. 6, 1915, No. 4, pp. 163-168. [The University of Pennsylvania Museum has recently acquired one of the very few ethnological collections pertaining to the 'copper Eskimo,' the people amongst whom Stefansson encountered the 'blond Eskimo.']

WORLD AS A WHOLE AND LARGER PARTS

Roosevelt, Theodore. **A book-lover's holidays in the open.** xvi and 373 pp.; ills. Charles Scribner's Sons, New York, 1916. $2.00. 8½ x 5½.

He whose field of interest is restricted by the narrow limits of a definition will not care to read this book. But, happily, geography is not a formula. The geographer would do well to know landscapes, to understand the spirit of the many-sided human creatures with whom he deals, to watch the play of forces with which geographic influences interact only occasionally, if he would seek to interpret the earth as the home of man. Geographic literature contains no more vivid description of the Bariloche region of Chile and Argentina than the one on page 145; nor is there a better of the Paraguayan *pantanals*, or marshes, than on page 154. The treatment of the people, whether of Brazil or Argentina or Chile, is sympathetic throughout. To the traveler, Lord Bryce's "South America: Observations and Impressions" and these chapters by Colonel Roosevelt are to be especially recommended. Few other books dealing with South America are at once so delightful, so informing, and so full of the real spirit of the race.

Three of the eleven chapters deal with our western country, three with South America, two with Africa. There is one on bird reserves at the mouth of the Mississippi, one on books, and one on hunting experiences. The preface is superb! In spite of this diversity of contents there is a bond of union in the pioneer quality of all the chapters. Hence also the geographic interest, for it is in the "borderland" that man's responses to nature are perhaps most keenly felt.

We feel sure that the sections on the Navajo and the Hopi need revision. The descriptive portions are most interesting, but special students of both tribes agree in giving the Navajo higher rank. They are independent, virile, well-adapted to a harsh environment, Indians of the best of the old types. The Hopi has learned to lean on the white; the Navajo would starve first. Two recent articles on the subject may serve to extend these brief criticisms (H. E. Gregory: The Navajo Country, *Bull. Amer. Geogr. Soc.*, Aug. and Sept., 1915; The Navajo Indian in Relation to the State, *Rep. of the 31st Ann. Lake Mohonk Conference*, 1913, pp. 64-68).

With moderate revision and the addition of some of the best of the author's hunting stories this book might well become the rival of the classics in hunting and adventure.

—— **Bridges, world's largest and most notable, some of the.** Ills. *Scientific American*, Vol. 113, 1915, Dec. 25, pp. 559-561 and pp. 565 and 567.

Cornish, Vaughan. **The strategic geography of the British Empire (considered in relation to the Central Powers).** *United Empire*, Vol. 7, N. S., 1916, No. 2, pp. 142-160. (Discussion, pp. 153-160.) [Abstracted in the July *Review*, pp. 66-67.]

McKie, J. I. **The probable influence of the war on the relations between the mother country and the dominions.** *United Empire*, N. S., Vol. 7, No. 1, pp. 94-101. [This essay was awarded a prize by the Royal Colonial Institute.]

Powell, E. T. **Empire and money market: The romance of a three hundred years' alliance.** *United Empire*, Vol. 6, N. S., 1915, No. 12, pp. 902-917. [British Empire.]

MATHEMATICAL GEOGRAPHY

Surveying and Geodesy

Cary, E. R. **Geodetic surveying.** ix and 279 pp.; maps, diagrs., ills., index, bibliogr. John Wiley & Sons, Inc., New York, 1916. $2.50. 8½ x 5½.

During the past fifteen years marked changes have occurred in the practice of geodetic surveying, and in his condensed textbook the author has confined himself to the best practice of the present day without padding with antiquated methods merely of historic interest. This will be especially appreciated by the man in the field or by the student who

wants results directly. The most recent methods developed by the U. S. Coast and Geodetic Survey are accepted as standard. In order to make the work complete and at the same time more convenient for a shorter course, the author discusses geodetic astronomy and the method of least squares separately in appendices.

The book contains a short introduction and eight chapters. The latter discuss, in order, reconnaissance; base lines; horizontal angles; adjustment of horizontal angles; computation of geodetic latitudes, longitudes, and azimuths; map projections; trigonometric leveling; and precise leveling. Most of these chapters are very brief, but intelligibility has not been sacrificed thereby.

About one third of the book is devoted to two appendices: I, Time, Longitude, Latitude, and Azimuth; and II, the Method of Least Squares. Throughout, the text is supplemented by the solution of numerous problems, and type forms are provided for the reduction of the complicated problems arising in geodetic work. The tables are especially complete for such a small volume. The book is well illustrated and the typography is very good. Numerous references to Government publications and other sources of more detailed information on actual field operations add to the value of the book.

James Gordon Steese.

Habermehl, K. G. **Photography applied to surveying.** 18 pp.; diagrs. Keuffel & Esser Co., New York, 1915. 25 cents. 7 x 5.

The idea of applying photography to surveying is almost as old as photography itself. Compared with the great number of publications dealing with the theory of photogrammetry, its use in actual practice in military and civil topography has been very slight because of the difficulties connected with the working out of the data contained on the plates. Only by tedious methods was it possible to correlate individual points on different photographic plates.

Since 1900 this situation has changed considerably through the development of stereophotogrammetry and Doctor Pulfrich's introduction of the stereocomparator for automatically reducing stereoscopic plates. This little pamphlet serves as an introduction to the subject and gives a chronological review of its principal applications.

James Gordon Steese.

PHYSICAL GEOGRAPHY

Geology and Geomorphology

Pirsson, L. V., and Charles Schuchert. **A text-book of geology.** x and 1051 pp.; maps, diagrs., ills., index. John Wiley & Sons, Inc., New York, 1915. $4.00. 9½ x 6½.

Part I

The scholarly reputation of the authors guarantees the general accuracy of this book; their experience as teachers lends great weight to their mode of presentation; the imprimatur of a well-known scientific publisher indicates a high grade of printing and illustration. These are some of the reasons why few textbooks of geology can be compared with this one for general excellence. The names of Geikie, Dana, Suess, and Chamberlin nearly exhaust the list. As a product of one of the foremost schools of geology in America it commands special attention.

Moreover, the illustrations are not merely different from but better than those in similar texts; for striking examples see Chapter VIII. The style is clear and direct. Explanations almost invariably proceed from the fundamental principle to a thorough discussion of a particular case. The skill with which Part I is written denotes a broad and deep understanding of student psychology. As a whole, an excellent book which deserves high success.

The following criticisms are offered in a spirit of helpfulness; they are not meant to be merely a catalog of trivial defects. Professor Pirsson says in the preface to Part I "... it commonly happens that the science is presented .... largely from the physiographic side, because this method of approach demands less background in preparation by previous basal studies ...." A better balance ought to be maintained, hence this book. Most critics will agree to this; certainly the reviewer does. Physical geology is not alone physiography.

But the physiography of this book is not only greatly diminished in volume; it is not of good quality. The section on ocean currents (pp. 84-85) begins with an explanation but wanders off into that empiricism which apparently exhibits lack of knowledge. Both undergraduate and graduate students of geology are in general profoundly ignorant of wind systems and ocean currents. The chief reason for so serious a shortcoming lies in

a widespread belief that a grammar-school knowledge of climate is all that a doctorate requires. Probably the next great advance in geology will be made when a thorough knowledge of physiography and especially climate is widely applied to the problems of geologic structure and history, as in Barrell's recent papers (e. g. Relations between Climate and Terrestrial Deposits, *Journ. of Geol.*, Vol. 16, 1908, p. 159 ff.). It is delaying that advance to give so little on either subject in what is otherwise a first-class book. After all, the best textbooks are those that serve the geology of the future as well as that of the present.

The section on *youth* and *maturity*, page 65, is the elementary physiography of twenty years ago. It confuses topographic youth and the youth of streams (see D. W. Johnson: Youth, Maturity, and Old Age of Topographic Forms, *Bull. Amer. Geogr. Soc.*, Vol. 37, 1905, pp. 648-653). The same might be said of the caution on page 376 regarding even summits as a poor guide to peneplanation. Only a few feeble amateurs still make so loose an interpretation as the one which the author condemns. The caution is labored and the conclusion wrong that "accordance of summit levels is what we should expect, not the reverse." The idea of expectable accordance is obviously based on Daly (The Accordance of Summit Levels Among Alpine Mountains, *Journ. of Geol.*, Vol. 13, 1905, pp. 105-125), but, since that time, *proof* has multiplied that Daly's conclusion, even if true, is applicable to a very small portion of the peneplaned surfaces of today. The section on page 350 is grammar-school, not college geography. Unfortunately it is what some geologists regard as serious and even advanced physiography. Modern physiographers and their work receive practically no attention. Neither Davis nor Salisbury is mentioned, save where the former is credited, on page 375, with introducing the word "monadnock"; which is almost like writing a book on geology and using Dana's name once to say that he employed the word "lagoon" in developing a theory about coral reefs. In view of these illustrations we should hardly expect to find a good physiographic map of the United States. In Figure 203 there is in many cases such total disregard of even the primary lines of relief as to make the map crude to the point of condemnation. The apology for the map in the title beneath it does not relieve the situation. On a par with it is the map of past glaciations, Figure 511, an inheritance from the maps of the past. The last few years have supplied data for a much better result. The improved map by Martin ("Physical Geography of Wisconsin," *Wisconsin Geol. Surv. Bull. No. 36,* 1916) should furnish a clue to the authors in their next edition.

The reader should now reread the first two paragraphs of this review. I. B.

Part II

The materials assembled by Professor Schuchert in the section on historical geology present an unusually satisfactory statement of all phases of this subject. In the aspects of the problem relating to purely physical history the author has given us an excellent summary of available knowledge in concise form. The history of geographic features, the relation of this side of historical study to that concerned with crustal movement and its causes, and the significance of geographic change in terms of influence upon biologic history have naturally been given an important place, though not unduly emphasized. It is not an overestimate to state that this work offers the best summary of studies on the geographic aspects of historical geology that has appeared up to this time.

Professor Schuchert's long experience as a paleontologist, the range of his personal activities, extending over the study of a large portion of the invertebrate group, and including even some of the vertebrates, have made it possible for him to give us a review of paleontologic history covering the field without undue emphasis on details. The method of separating important biologic groups for discussion at special stages in the development of the subject seems to the reviewer eminently satisfactory.

From the point of view of the instructor, the arrangement of material in this work is excellent. The illustrations are clear and well chosen. Perhaps the highest compliment that can be paid to the work is that it has met with unusual favor in actual class work on historical geology and seems to fill a distinct need in courses for undergraduates entering upon the study of this subject. JOHN C. MERRIAM.

BAKER, H. B. **Origin of continental forms, V.** *Sixteenth Rept. of the Michigan Acad. of Sci.*, pp. 99-103. Lansing, 1914.

BERG, ALFRED. **Geologie für Jedermann: Eine Einführung in die Geologie, gegründet auf Beobachtungen im Freien.** (Series: Der Naturforscher.) 259 pp.; diagrs., ills., index, bibliogr. Theod. Thomas Verlag, Leipzig [1912]. M. 3.75. 8½ x 5. [A helpful manual of practical observation. In the section on topographic maps the figure which appears on the back of every U. S. Geological Survey topographic

sheet showing a perspective view and a contour-map of the same region is closely imitated, without credit.]

Biasutti, R. **Sulla nomenclatura relativa ai fenomeni carsici.** *Riv. Geogr. Italiana,* Vol. 23, 1916, No. 1, pp. 45-55.

Galitzin, B. **The determination of the epicentre of an earthquake from two observed azimuths.** Diagrs. *Bull. de l'Acad. Impér. des Sci.* [*de Pétrograd*], 1914, No. 15, pp. 1137-1156.

Vaughan, T. W. **The present status of the investigation of the origin of barrier coral reefs.** *Amer. Journ. of Sci.,* No. 241, Vol. 41, 1916, pp. 131-135. ["A preface to 'Relations of Coral Reefs to Crust Movement in the Fiji Islands,' by E. C. Andrews," listed above, under "Melanesia, Micronesia, and Polynesia."]

Phytogeography and Zoögeography

Hesse, Richard, and Franz Doflein. **Tierbau und Tierleben in ihrem Zusammenhang betrachtet.** Ills., index. **Vol. 1:** R. Hesse. **Der Tierkörper als selbstständiger Organismus.** xvii and 798 pp. **Vol. 2:** F. Doflein. **Das Tier als Glied des Naturganzen.** xv and 960 pp. B. G. Teubner, Leipzig, 1914. Mk. 20 for 2 vols. 11 x 8.

This work in two volumes gives a very detailed account of the structure, habits, physiology, adaptations, life histories, and inheritance among animals. The second volume is the most interesting of the two from the standpoint of ecology and animal distribution. It takes up quite adequately the effect of food supply, enemies, sexual characters, migrations, development of community life, symbiotic relations, parasitism, and the resulting specialized adaptations.

The authors take up the cyclic growth of such animals as the mollusks, the various media in which animals live, the chemical composition of these media, and the general effects of changes in media, temperature, and climate in causing variations.

It is impossible to do justice to the completeness and detail given in this publication within the limits of a review. Briefly, the work is a masterpiece, both in detail of description, information, and illustration. Although especially adapted for the college library, yet these books would be a splendid addition to the library of any serious student of animal life. They contain little that is new, and yet the manner of presentation and the illustrations given are fresh, most interesting, and many of them original.

R. W. Sharpe.

Baker, H. B. **Physiographic and molluscan succession in lake pools.** Maps. *Sixteenth Rept. of the Michigan Acad. of Sci.,* pp. 18-45. Lansing, 1914. ["The problem under consideration is the physiographic succession in beach pools, which are formed along the shores of larger lakes by wind and current action, and the corresponding ecological succession in the molluscs they contain."]

Briggs, L. J., and H. L. Shantz. **Hourly transpiration rate on clear days as determined by cyclic environmental factors.** Diagrs., bibliogr. Reprint from *Journ. of Agric. Research,* Vol. 5, 1916, No. 14, pp. 583-650. U. S. Dept. of Agric., Washington, D. C.

Krylov, P. N. **Sur l'oscillation de la limite entre les régions des forêts et des steppes.** *Bull. de l'Acad. Impér. des Sci.* [*de Pétrograd*], 1914, No. 16, pp. 1161-1177. [In Russian.]

Moore, Barrington. **Notes on succession from pine to oak.** *Botanical Gaz.,* Vol. 61, 1916, No. 1, pp. 59-66. [The view, supported by Cowles's work in the Great Lakes region, that regards the pine as representing an earlier stage in the evolution from a simpler to a more complex floristic association has been somewhat modified by Taylor's investigations on the pine barrens of New Jersey. An unquantitative examination of the pine-oak distribution of a small area on the outwash plains of Hempstead, L. I., confirms the complex nature of the problem and suggests possibilities for detail research.]

Sampson, A. W. **Natural revegetation of range lands based upon growth requirements and life history of the vegetation.** Ills. *Journ. Agric. Research,* Vol. 3, 1914, pp. 93-148. U. S. Dept. of Agric., Washington, D. C. [Reviewed by H. L. Shantz in *The Plant World,* Vol. 20, 1916, No. 6, pp. 167-169; whence entry is taken.]

HUMAN GEOGRAPHY

Economic Geography

Distribution

Pratt, E. A. **The rise of rail-power in war and conquest, 1833-1914.** xii and 405 pp.; index, bibliogr. P. S. King & Son, Ltd., London, 1915. 7s. 6d. 9 x 5½.

Very early in the history of steam railway development the advantages of this improved system of transportation for purposes of warfare was a matter of serious consideration. In 1833, the building of railways with a view to their use for strategical purposes was discussed in Germany. In 1842, a comprehensive system of such lines, usable in both peace and war, was under construction. The same year this fact was pointed out in the French Chamber, viz., that Germany already was building, in the direction of France, a system of "aggressive lines" which was a part of a larger system of railways which would enable war to be conducted against France and Russia at the same time. It remained, however, for the American Civil War to inaugurate a really scientific use of railways for military purposes. "Many of the problems connected therewith were either started in the United States or were actually worked out there, precedents being established and examples being set which the rest of the world had simply to follow, adapt, or perfect." For instance, there is traceable to the time of our Civil War the use of armored trains, the ambulance or hospital train, the creation of a special corps to build, destroy, or operate railways, the problem of conducting warfare far from the base of supplies by means, if necessary, of a single-track system of railways, to say nothing of other equally as important problems which even in the present war are matters of great moment.

In showing the modern application of military tactics to railway systems, the countries selected were Germany, France, and England; while practical illustrations are given by an impressive description of the military uses of railways in the Crimean, Franco-German, Russo-Turkish, Russo-Japanese, and Boer Wars. Finally, as an appropriate culmination of his description of the evolution, in numerous countries, of rail-power in warfare, the author presents a series of generalizations and theoretical conclusions under four heads, viz., advantages of a railway system capable of meeting the requirements of the military situation; conditions essential for efficiency; limitations to the usefulness of railways in time of war; drawbacks and disadvantages.

The book is one which should appeal primarily to the student of military history, although, in view of the present-day widespread interest in military matters, it cannot fail to hold the attention of the general reader. It contains no inconsiderable amount of grist for the geographer's mill. A. L. Bishop.

Aspe-Fleurimont, —, and Henri Chevalier. **Un programme de réformes économiques: Transports par fer, par eau, par mer.** *Bull. Soc. de Géogr. Commerc. de Paris,* Vol. 38, 1916, No. 1-2-3, pp. 12-38.

—— **Ships, Re-filling the sea with.** Ills. *Dun's Rev., Internatl. Edit.,* 1916, May, pp. 47-50. [On the present shipbuilding activity, which is not able to fill the demand. One of the anomalous conditions created by the war is strikingly illustrated in a view showing a full-rigged sailing vessel moored to a New York dock with sky-scrapers in the background.]

—— **Telephone, Voice voyages by the National Geographic Society: A tribute to the geographical achievements of the.** Map, ills. *Natl. Geogr. Mag.,* Vol. 29, 1916, No. 3, pp. 296-236.

HISTORY OF GEOGRAPHY AND EXPLORATION

Baratta, M. **L'opera scientifica di Giuseppe Mercalli.** Ills. *Boll. Soc. Geol. Italiana,* Vol. 34, 1915, No. 2, pp. 343-419. Rome. [Prominent Italian vulcanologist, late director of the Vesuvius observatory.]

Hutcheon, J. **Geography: Its field, its fascination, and its future, with special reference to South Africa.** *Journ. Manchester Geogr. Soc.,* Vol. 30, 1914, Pts. 3 and 4, pp. 145-153.

Kerr, J. G. **Sir John Murray: Obituary notice.** *Proc. Royal Soc. of Edinburgh,* Vol. 35, 1914-15, Part 3, pp. 305-317. [Bibliography, pp. 313-317. See also item below, under S[—], A. E.]

McF[arlane], J. **Geography at the British Association.** *Geogr. Journ.,* Vol. 46, 1915, No. 5, pp. 374-380. [Contains abstracts of the papers read at the meeting.]

S[—], A. E. **Sir John Murray, K.C.B., 1841-1914.** *Proc. of the Royal Soc.,* Series B, Vol. 89, 1916, No. 612, pp. vi-xv. [See also item above under Kerr, J. G.]

THE GEOGRAPHICAL REVIEW

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WORLD-WIDE CHANGES OF TEMPERATURE

By CHARLES F. BROOKS, Ph.D.
Yale University

Why was the summer of 1916 hot and damp in the central and eastern United States? Why was that of 1915 cool and extraordinarily wet in the Middle West? Why was there so much snow in New England in the winter of 1915 to 1916? Was the weather abnormal in other parts of the world at the same time; and, if so, do past records show the simultaneous occurrence of similar extremes? Does the study of the weather of the world as a whole offer any possibilities for making seasonal forecasts? To these and other similar questions only tentative answers can now be given. Some well-established correlations between temperature departures in widely separated parts of the earth are summarized in this article; and the author has assembled weather data of recent months, which, in the absence of complete data, can be offered only as possible illustrations of these correlations.

As these correlations deal with departures from the average, a summary of the normal distribution of pressure may not be out of place here. The intense heating of the air in the equatorial regions leads to a poleward flow of air in the upper levels. On account of deflection, these winds form great whirls, the centrifugal force of which reduces the atmospheric pressure at the earth's surface in the higher latitudes and piles up the air in high pressure "belts" in the sub-tropics. This would-be orderly arrangement is greatly disturbed in winter by the coldness of the continents and the relative warmth of the oceans, which favor the formation of great high-pressure areas on the land and of low-pressure areas over the water. Thus the sub-polar low pressures are still further reduced over the ocean and more than neutralized over the continents, while the sub-tropical high pressures are increased where there is land and somewhat lowered over the water. In summer, the oceanic sub-tropical "highs" are strengthened, the sub-polar "lows" are weakened; and low-pressure areas develop over the heated continents.

It is evident from the foregoing that the changing temperature relations between land and water strongly influence atmospheric circulation, and, furthermore, that winter temperatures in places far apart may vary together in the same or in opposite directions. Such is markedly the case in the North Atlantic region, where the connections depend largely on the temperature distribution of the ocean surface waters. There, the Iceland cyclone is intensified[1] when the water in the vicinity is warmer than usual and weakened or even replaced by an anticyclone when it is colder.[2] When the pressure at one place is reduced, it must rise correspondingly elsewhere. Thus it is not surprising that the pressure over the Azores is higher than normal 70 to 80 per cent of the time that the pressure of the Iceland cyclone is lower than normal.[3] A similar relation seems to exist between the Aleutian low-pressure area and the North Pacific sub-tropical high-pressure area, the center of which is near the Hawaiian Islands. Furthermore, pressure changes in the continental anticyclones of Eurasia, North America, and Greenland, and in the Aleutian and Iceland cyclones, seem to be of opposite sign.

Not only may warm water intensify the Iceland cyclone and, in turn, the surrounding anticyclones, but also water temperatures below normal in the vicinity of the high-pressure belt tend to raise the pressure locally and so to shift the Azores center,[4] or perhaps to develop a separate one, as over Bermuda.[5] Conversely, local warm water tends to lower the pressure. The water temperatures affect the pressure distribution; the pressure distribution controls the winds and, so, the weather; and, in turn, the winds through ocean currents and surface drift bring about a rearrangement of water temperatures. As western Europe and eastern North America are influenced in common by the North Atlantic air circulation, the weather on the opposite sides and in different parts of the same side should not vary independently.

Professor Hildebrandsson states[6] that, in winter, the weather over part of the ocean lying between Iceland and Norway agrees with that of the north of Europe but is in opposition to the weather in the sub-tropical region, the Azores and the Mediterranean. The same contrast between the north and south is said to occur in North America, but inversely to the relation in Europe; so that if the winter is cold in the north of Europe, it is cold in Mexico and the United States, but mild in the south of Europe and in the north of North America.[7] These relations, however, are often

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[1] As in December, 1914, January, February, December, 1915, and January, 1916. These and other months mentioned in the footnotes are suggested as possible illustrations, water temperatures and full pressure data not being available now. See the table.

[2] November, 1915, March, 1916.

[3] J. von Hann: Lehrbuch der Meteorologie, Leipzig, 1915, pp. 637 to 644, gives a good summary of European and other correlations.

[4] To the east—March, December, 1915, January, 1916; to the west—November, 1914.

[5] January, February, April, 1915, January, 1916.

[6] Summary in *Nature*, Vol. 97, 1916, p. 228.

[7] Such was more or less the case in March, 1915.

disturbed by external causes of a superior order, such as the varying heat of the sun.[8] Correlations are usually more evident in winter, when local weather is more under the influence of the atmospheric circulation than in summer, when direct solar control usually dominates.

Let us consider these correlations in detail. In the eastern United States the type of winter weather, marine[9] or continental,[10] is determined largely by the presence or absence, respectively, of the Bermuda "high." The cause of the Bermuda "high" seems to be a cold water surface,[11] which may depend on the temperature and strength of the Labrador Current.[12] The cold water and ice set in motion one winter by a strong Iceland cyclone may serve to strengthen the Bermuda anticyclone and to weaken the Iceland "low" in the next winter. When the Iceland cyclone is strong, northwestern Europe is warmed by strong southwest winds, and eastern North America is cooled by the strong northwest winds of the other side. On the other hand, when the Iceland cyclone is weak, the weather on both sides tends to become normal for the latitude: which means a cold winter in northwestern Europe and a warm one in northeastern North America. Thus arise the alternating cold and warm winters in opposition on the two sides of the Atlantic, which may continue uninterrupted for a decade.[13]

Europe and eastern North America, on the contrary, may be cold at the same time, as in March, 1916. Such is the case when the Iceland "low" is displaced south and extended west, and when many anticylones move on the northern track across the eastern United States. March, 1915, was similar to March, 1916, in the first particular but not in the second.[14] The possible chains of cause and effect may be as follows: (1) intense Iceland cyclone and Azores anticyclone[15]—strengthened trade winds—strong Equatorial Current—warm Gulf Stream in the following winter;[16] (2) strong Iceland cyclone with high northerly winds on the west side[15]—strong Labrador Current with much ice—cold water in the northern part of the ocean.[17]

Also, coincident warm weather may occur in northwestern Europe and eastern North America, as under the conditions prevailing in January, 1915 and 1916. In January, 1916, the pressure was much above normal in a belt extending at least from southern Europe across the Atlantic through

[8] January, 1916, may have been an illustration of this condition.

[9] January, February, April, 1915, January, 1916.

[10] December, 1914, March, 1915, 1916.

[11] November, 1914, January, 1916, summer, 1916? Southerly winds off the ocean in midsummer bring sultry hot weather to the North Atlantic states.

[12] W. J. Humphreys: Why Some Winters Are Warm and Others Cold in the Eastern United States, *Monthly Weather Rev.*, Vol. 42, 1914, pp. 672-675, 35 charts.

[13] Cf. Hann: *op. cit.*, pp. 639, 640, and C. Abbe, Jr.: Washington and Paris Winters, Table 2, *Monthly Weather Rev.*, Vol. 42, 1914, p. 627 (Opposition Washington-Northern Europe, 1874 to 1883).

[14] See A. J. Henry: Control of March Weather by Pressure Distribution, p. 139, and Charts II, IV, and IX, *Monthly Weather Rev.*, Vol. 44, March, 1916.

[15] Winter 1914-15.

[16] M. W. Campbell Hepworth: The Gulf Stream, *Nature*, Vol. 93, 1914, pp. 441-443. See also footnote 33.

[17] Winter 1915-16.

the southeastern United States to Alaska. The pressure of the Iceland cyclone was about normal, but the southwest winds were strong because of the intensified "high" on the south. In the Pacific, the Aleutian "low" seems to have been pushed south, for the pressures were below normal in the United States west of the Rockies and at Honolulu. These pressure conditions produced intense cold in central North America and mild weather in the East;[18] while England experienced the warmest January on record.[19] This strengthening of the "highs" without a lowering of pressure in the "lows" may have been in response to excessive overflow of air from the tropics.[20] In fact, cold weather in central North America comes with a southward displacement of the Aleutian "low," a movement not wholly unrelated to a similar one on the part of the Iceland center, as seems to be indicated in February and November, 1915, January and March, 1916. In April the connection between the two oceans seems to have been particularly patent, the important pressure reversals between the 19th and 20th being simultaneous in the Azores, the Aleutians, and Hawaii.[21]

Temperatures in the southern hemisphere seem to be no less closely correlated. Mossman[22] has found that there is opposition between the Weddell and Ross Seas in pressure and wind at all seasons and opposition in temperature in winter. Furthermore, there seem to be seasonal contrasts between the Ross Sea, on the one hand, and southern South America, parts of West Australia, and New Zealand, on the other.[23] The winter of 1915 may perhaps be taken as an illustration. In Australia, the winter and greater part of the year were remarkably warm, with prevailing moist, north winds.[24] The Argentine winter was very cold, and the ice conditions in the Weddell Sea were severe.[25] South Africa was apparently colder than usual.[26]

In addition to correlations within a hemisphere there are three types of connection between centers of action on opposite sides of the equator. One is direct, where winds flow from one to another, so that any variation in

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[18] Temperature departures: at Havre, Mont., —15°C.; in the East, +3° to 5°C. from normal January temperature (*Monthly Weather Rev.* Vol. 44, 1916, p. 48, and Chart IV). For remarks on Canadian conditions see *Nature*, Vol. 97, 1916, pp. 470-471.

[19] London was warmer by 1°C. than any January at least since 1858 (*Symons's Meteorol. Mag.*, Vol. 51, 1916, p. 7).

[20] See *Monthly Weather Rev.*, Vol. 44, 1916, p. 78; *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, p. 963. The fact that January, 1916, was abnormally wet at Sta. Lucia and, to some extent, at Caylloma in the Andes of Peru may have some significance here, as indicative, perhaps, of abnormal doldrum rains.

[21] *Monthly Weather Rev.*, Vol. 44, 1916, p. 210. Before the 20th, pressures were below normal in eastern and southern Alaska and above normal at Honolulu and the Azores; after the 19th, pressures were above normal in Alaska (eastern and southern) and below normal at Honolulu and the Azores.

[22] Review, *Geogr. Rev.*. Vol. 1, 1916, p. 323.

[23] See also R. C. Mossman: Southern Hemisphere Seasonal Correlations, *Symons's Meteorol. Mag.*, Vols. 48 and 49, 1913 and 1914.

[24] *Symons's Meteorol. Mag.*, Vol. 51, 1916, pp. 4-6; and *Nature*, Vol. 97, 1916, p. 471.

[25] *Geogr. Rev.*, Vol. 2, 1916, pp. 54-57.

[26] Temperatures at Cape Town and Johannesburg from *Symons's Meteorol. Mag.* were compared with those shown in Bartholomew's Physical Atlas, Part III, Pl. 10, allowance being made for the sea-level "reduction" of the latter.

Departures in Temperature, Rainfall, and Controlling Centers of Action

		Europe						North America									
		London		Iceland cyclone		Azores anticyclone		Bermuda		St. Johns, N. F.			Washington, D. C.		Pierre, S. D.		
		T	R	Pr	Po	Pr	Po	Pr	T	Pr	T	R	T	R	Pr	T	R
1914	Nov....	+0.9	+	−1	0	+2	W	+3	−0.4	−3	0.1	+	+0.2	—	+1	+5.4	—
	Dec....	+1.5	+	−8	SE	+4	0	+1	+1.3	+2	−2.2	—	−1.8	+	+6	−2.8	—
1915	Jan....	+0.7	+	−2	SE	+4	W	+2	+0.8	+2	+1.2	—	+1.5	+	−2	+1.0	+
	Feb....	+0.4	+	−4	SE	+4	0	−1	+0.2	+5	+1.4	0	+2.4	0	+1	+3.6	+
	Mar....	+0.2	—	−10	far SW	−3	far NE	−8	−2.5	−22	+2.8	—	−1.9	—	+9	−4.8	—
	April...	0.0	—	−3	NE	+8	NE	−2	−0.7	+3	+2.4	—	+3.5	—	0	+4.6	+
	Nov....	−2.4	0	+3	E	0	N	−1	−1.2	−6	+2.2	+	+0.7	—	−3	+3.7	+
	Dec....	+2.3	+	−3	SE	+	E	−1	−1.7	−7	+2.3	0	−0.5	—	−1	+3.2	—
1916	Jan....	+4.0	—	−1	E	+4	E	+7	−1.1	−5	−1.1	—	+3.8	—	+4	−6.4	0
	Feb....	0.0	+	0	N	+10	N	+2	+2.6	0	−0.5	+	−0.2	0	+6	+1.3	—
	Mar....	−1.3	+		far SW	....		....		−8	−1.3	0	−2.4	—	−2	2.8	—
	April...	+0.6	—	....		....		−2	+0.1	−2	+1.4	—	+0.2	0	+3	−1.1	—
	May....	+1.8	0	....		....		+1	−0.9	−8	+0.8	+	+1.4	—	−2	−1.3	+
	June...	−2.4	0	....		....		−1	−2.0	+3	+0.9	—	−1.7	+	+1	−3.0	—
	July....	−0.8	—	....		....		+1		....			+0.7	0	−1	+3	
	Aug....	....		....		....		+1		....			+0.9	—	+1	−0.6	+

Abbreviations:

T: departure of monthly mean temperature from the normal, C. degrees.

R: departure of total rainfall of the month from the normal; 0 indicates less than 10%.

Pr: departure of month's mean pressure from normal; units millibars (or kilobars), 1=0.03 inches of mercury, approximately.

Po: position of the center of lowest or highest pressure relative to the normal.

Sources: (Iceland and Azores pressures having been derived from map comparisons, or inferred, are uncertain.)

November, 1914, to April, 1915—

Charts IX, *Monthly Weather Rev.*, Vols. 43-44, Nov., 1915, to April, 1916; and tables, *ibid.*, Vols. 42-43, Nov.-Apr., 1915.

November, 1915, to January, 1916—

Monthly pressure maps of Europe in *Das Wetter*, Vols. 32 and 33, Nov., 1915, to Jan., 1916.

Maps of mean monthly pressure, Bartholomew's Physical Atlas, Part III, Pl. 12.

Monthly Weather Rev., tables, November, 1915, to January, 1916.

February to June, 1916—

Monthly Weather Rev., tables, Feb. to June, 1916.

Symons's Meteorol. Mag., Vol. 51, "Weather of the Month."

London data from *Symons's Meteorol. Mag.*; North American data from *Monthly Weather Rev.*

July and August, 1916—

Symons's Meteorol. Mag., Vol. 51, "Weather of the Month."

Washington daily weather maps of U. S. Weather Bureau.

either may be felt in the other hemisphere. On this basis, forecasts are made of the character of the southwest-monsoon rainfall in India,[27] and of the height of the Nile flood.[28] A second type of correlation is that of simultaneous expression of a common cause. Thus, when the sun's heat is more intense and produces a lower pressure in the equatorial regions, as at a time of sunspot maximum like the present, the polar pressures may rise and polar weather may then be colder.[29] It is possible that the following

27 Summary in *Nature*, Vol. 96, 1916, p. 657; extensive review, *Quart. Journ. Roy. Meteorol. Soc.*, Vol. 42, 1916, pp. 129-132. The forecast for 1916 is summarized in *Nature*, Vol. 97, 1916, p. 490.

28 *Scientific American*, Vol. 110, 1914, p. 392.

29 Although Blanford (see Hann: *op. cit.*, p. 641) finds correlation of low tropical pressures and high polar pressures, with sunspot maxima, the recent investigations of Dr. G. T. Walker (review, *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, p. 963) question such a relation.

weather conditions in the middle of 1915 had such a common origin: warm damp winter in Australia, warm summer in the southern United States;[30] extraordinary ice conditions reported by Shackleton in the Weddell Sea, cold winter in southern South America; unusual ice in Arctic waters reported by the Danes[31] north of Iceland and by MacMillan's expedition west of Greenland;[32] pressures above normal and temperatures below normal in Canada and Alaska;[30] cool and very wet weather in the central United States.[30] It is suggestive, also, that in the central United States the three very wet Mays and Junes occurring in the last thirty-five years came in 1892, 1903, and 1915—all during sunspot maxima (the average period from one sunspot maximum to another is 11.4 years).

A third type of correlation is the delayed, indirect effect which operates through the medium of ocean currents.[33] The Gulf Stream, for instance, is supported by the Equatorial Current, the strength and temperature of which depends on the trade winds on both sides of the equator. Although this control of the weather of one period over that of a later one has been mentioned, an immediate, though speculative, example may be added here. It seems possible that the character of the summer of 1916 was connected in some degree with the weather of the summer of 1915. The warmth of the Gulf region communicated slowly by the Gulf Stream to the northeastern Atlantic may have had some part in producing the intensity of the Iceland cyclone in December, 1915. This strength of the Iceland cyclone probably set in motion southwards the accumulated ice in Greenland waters, the first effect of which was to raise the pressure about Iceland and so to give England the weather which culminated in the extraordinarily wet and snowy March (see table). In April, the reports of pack-ice off Newfoundland, with the establishment of a more or less permanent "high" east of New England, indicated, perhaps, further progress of the ice. In the northeastern United States, in April, May, and June, 1916, the resulting on-shore winds off the cool ocean brought cool wet weather; but in July, the damp ocean winds from the south were warm. To the stagnant anticyclone in the east, which at once made gentle winds and prevented rapid movement of cyclones across the United States, may be ascribed, in part at least, the July hot spell of the Middle West. It seems clear that the weather near the sources of ocean currents and the strength of the driving winds have effects thousands of miles away and months later.[34]

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[30] See discussions of "The Weather of the Month," "Forecast and Warnings," charts and tables in *Monthly Weather Rev.*, Vol. 43, 1915, May to August inclusive.

[31] *Nature*, Vol. 97, 1916, p. 248.

[32] *Geogr. Rev.*, Vol. 2, 1916, p. 65.

[33] "Meteorological Aspects of Oceanography" is the title of an article by Hans Pettersson in the *Monthly Weather Rev.*, Vol. 44, 1916, pp. 338-341, which deals with this subject, particularly in relation to seasonal forecasts.

[34] A successful prediction of the temperature over northwestern Europe last winter was made by P. H. Gallé, who based his forecast on the close positive correlation between the strength of the North Atlantic trade winds from May to October and the temperature over northwestern Europe the following December to February. See note in *Nature*, Vol. 97, 1916, p. 526.

The weather in widely separated parts of the earth is correlated because of the extensive control of the large belts and centers of atmospheric action. In the North Atlantic, for example, the strength, positions, and relations of the Iceland cyclone and of the Azores anticyclone dominate the weather of the adjacent region; and the resulting movements of surface waters of different temperatures change these centers of action. Similar relations seem to exist elsewhere. These are subsequent, however, to changes in the sun's radiation, which produce immediate, world-wide pressure alterations. Any possibilities for widespread seasonal forecasts must rest, therefore, first on an ability to forecast solar changes and, second, on a knowledge of the immediate and subsequent atmospheric effects of such variations.

SOUTH AMERICAN TIMBER RESOURCES AND THEIR RELATION TO THE WORLD'S TIMBER SUPPLY*

By RAPHAEL ZON
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The forest resources of South America are very great, but just how great no one at present can tell, for vast areas known to be forested are as yet entirely unexplored. Therefore any estimates must necessarily be in the nature of very rough approximations, which later explorations and surveys may entirely upset. On the basis of the information now available, the total forest area of South America may be placed in the neighborhood of 3,000,000 square miles (7,787,000 square kilometers, or 1,924,000,000 acres). By countries, this area may be distributed roughly as follows:

TABLE I—FOREST AREAS OF SOUTH AMERICA BY COUNTRIES (GENERAL TABLE)

COUNTRY	FOREST AREA IN SQUARE MILES	MILLION ACRES	FOREST AREA PER 100 INHABITANTS IN SQUARE MILES	FOREST AREA IN PER CENT OF TOTAL LAND AREA
Argentina	231,000	147	3.0	20
Bolivia	284,000	181	12.0	55
Brazil	1,541,000	988	9.0	48
Chile	59,000	38	15.0	15
Colombia	241,000	155	5.0	55
Ecuador	145,000	93	10.0	67
Guiana	64,000	40	3.0	29
Paraguay	84,000	54	10.0	80
Peru	176,000	112	10.0	25
Uruguay	No forests of	commercial impor	tance	
Venezuela	181,000	116	7.0	45
Total or Average	3,006,000	1,924	8.0	38

The commercial value of these vast forests is still very little known. Botanically, the South American forests, particularly those near the equator and along the river bottoms, consist of a large number of species. "On a single acre it is hardly possible to find two or three trees of the same kind." This botanical wealth of species can not be used as a measure, however, of commercial value. The reasons for the widespread use of wood are its lightness, combined with strength, and the ease with which it can be worked. It is these qualities that make wood almost indispensable to our civilization. What is demanded, especially in the international markets, is a light, strong, easily workable timber which can be supplied in large quantities and delivered at a low price. Such timber has so far been supplied by the northern coniferous and temperate hardwood forests

* Read on January 3, 1916, before Section III of the Second Pan-American Scientific Congress, Washington, D. C.

of Europe and North America. The richest forests in the world commercially, those of northern Russia and Sweden, botanically are very poor. They consist of only two species—the Scotch pine and the spruce.

If the South American tropical forests contain only a few commercially useful tree varieties which are scattered among a large number of other species of low or no present commercial value at all, the high cost of logging them may make the exploitation of such forests unprofitable. As a matter of fact, this has been exactly the case with nearly all of the tropical forests until recently. The few trees known at present as commercially valuable are invariably found scattered among a great many unutilizable ones. In order to cut and remove the valuable species it is necessary, therefore, to cut and leave a good deal of useless material. A more intimate study within recent years of the physical properties of tropical woods by the United States foresters in the Philippines has shown, however, that the forests of the Philippine Islands and the Malay Archipelago contain a vast group of trees (*Dipterocarpa*) which, although they are hardwoods, possess many of the qualities of the common woods used in international trade, namely, lightness, strength, and softness. The presence of a large number of utilizable woods in other tropical forests, in addition to the rare woods, such as dye woods, rosewood, mahogany, and others, would place them on an entirely new commercial basis, since they would contribute to the future supply of common hardwood timber for the world.

If further studies show that the forests of South America contain, in addition to the rare dye woods, *quebracho,* greenheart, mahogany, etc., a large number of utilizable hardwoods similar to *cedro,* which is already being exported from there, the economic importance of the South American forests will be great. Our present knowledge of the technical properties of the woods of the South American forests is very inadequate. From what we do know at present, however, there are only three species which, because of their technical properties, may furnish woods suitable for wide use. These are the Paraná pine (*Araucaria brasiliensis*) and the Chilean pine (*Araucaria imbricata*), two coniferous species, and the Spanish cedar, or *cedro* (*Cedrela*, several species), which is a soft hardwood. Most of the other hardwoods known at present are exceedingly hard and heavy and, therefore, difficult to saw. How hard they are may be judged from the fact that sawmill machinery manufactured in the United States especially for sawing hardwoods in South America and guaranteed in advance to cut 20,000 feet of hardwoods daily has, in innumerable tests, developed a maximum capacity of only 7,500 feet a day.

The following is an attempt to estimate very roughly the areas occupied by the different classes of South American woods and on the basis of these estimates to outline the possible economic importance of South American forest wealth. The total forest area of 1,924,000,000 acres may be divided into distinct forest regions (map, Fig. 1) according to the prevailing com-

mercial species: (I) the coniferous forest, comprising (1) stands of nearly pure Paraná pine and (2) stands of Chilean pine mixed with some larch, cedar, and South American beech, which may be designated as the Antarctic beech region; (II) the vast hardwood forest which comprises (3) the tropical hardwood forest, in which Spanish cedar is invariably present, and (4) the forest of subtropical hardwoods; (5) stands in which *quebracho* forms the important species, and (6) stands in which greenheart predominates.

1. The Paraná pine forest region[1] occupies an area of approximately 309,000 square miles, or 200,000,000 acres (802,000 square kilometers), the greatest part in the southeastern portion of Brazil in the states of Rio Grande do Sul, Santa Catharina, Paraná, São Paulo, southern Minas Geraes, and Matto Grosso. The range of this pine is between the parallels of 18° and 32° S. It derives its name from the state of Paraná in Brazil, where it is most plentiful and is commercially the most important tree. In Paraná one company alone owns a solid forest, much of which is still in the primitive state, aggregating 3,000,000,000 feet and averaging over 4,000 feet to the acre. Some stands of Paraná pine contain as much as 15,000 or 20,000 board feet to the acre.

2. The Antarctic beech region[2] is the only other region in which conifers are found, such as the Chilean pine, larch, and cedar. The Chilean pine is botanically very close to the Paraná pine. This region lies chiefly on the slopes of the Andes and occupies in all an area of approximately 96,000 square miles (61,000,000 acres), or 248,000 square kilometers.

3. The tropical and subtropical hardwoods[3] occupy by far the largest areas. The tropical hardwoods are found over an area of some one and a half million square miles (more than one billion acres), and the subtropical hardwoods over an area of 259,000 square miles (165,000,000 acres). The most valuable tree of the tropical hardwood forest is the *cedro*. *Cedro* (*Cedrela odorata* and other species) constitutes one of Brazil's most important export hardwoods and is commonly known in the United States as Spanish cedar. This species does not form pure forests over large areas but is found scattered among the tropical hardwoods throughout Brazil from the Amazon to the Paraná River. The largest and highest-grade logs are cut from the forests in the state of São Paulo and in the territory lying south and immediately west of it. In this portion of Brazil the wood is in high favor commercially and is consumed in large quantities. Its softness, the ease with which it can be worked, its ability to

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[1] R. E. Simmons: Lumber Markets of the East Coast of South America, *Bur. of Foreign and Domestic Commerce Special Agents Series No. 112*, Washington, 1916. [Information with regard to the rest of the continent is to be found in the same writer's "Lumber Markets of the West and North Coasts of South America" in the same series, No. 117. Both of these reports are abstracted in the "Geographical Record" in this number.—EDIT. NOTE.]

[2] Bailey Willis: Northern Patagonia, Vol. 1 and atlas. Published for the Ministry of Public Works, Argentine Republic, by Charles Scribner's Sons, New York, 1914.

[3] Theodore Roosevelt: Through the Brazilian Wilderness, Scribner, New York, 1914.

Raphael Zon: The Forest Resources of the World, *Forest Service Bulletin 83*, U. S. Dept. of Agriculture, 1910.

hold paint and take a polish, as well as its high grade, commend it for many special uses and make it first in economic importance of all the Brazilian hardwoods. It enters aggressively into competition with the imported pines and in certain markets is preferred for a number of uses. In Brazil it is being cut annually at the rate of about 47,000,000 board feet. Its range coincides practically with that of the tropical hardwoods. Of the vast variety of other hardwoods which are found in mixture with cedar, *peroba* and *acapu* (*Voucapoua americana*) are the two species which may be considered among the chief woods for export from the Amazon Valley to the European markets. At any rate, these species, more than any other hardwoods, meet locally the need for hardwoods and, therefore, make unnecessary the importation of American and European hardwood lumber.

4. The hardwoods in which *quebracho*[4] forms the commercially important species are found chiefly in northern Argentina, in the provinces of Tucumán, Santiago del Estero, and Santa Fé, the territories of Formosa and the Chaco, and in the Chaco of Paraguay. Botanically, however, *quebracho* is distributed over a much larger area. The total possible yield from the forest areas where *quebracho* occurs in commercial quantities is estimated at 168,000,000 tons, while the present yearly consumption of the wood for all purposes is a little less than 1,000,000 tons. Since the average yield per acre is approximately two tons of the wood, the total forest area in which *quebracho* occurs in commercial quantities is about 84,000,000 acres. The small yield per acre makes it necessary to cut over about 500,000 acres annually in order to secure the 1,000,000 tons of wood which are in demand. *Quebracho* wood is one of the principal commercial products of South America, its main value being for tannin extract and cross ties.

5. Greenheart (*Nectanda rodioei*),[5] with which is associated mora (*Dimorphandra mora*), is the most important tree of British Guiana, the only place where it is being cut extensively. There it is found most abundantly along the Essequibo, Demerara, and Berbice Rivers. Greenheart grows along the seacoast and watercourses, seldom extending more than 50 miles inland and never more than 100 miles. It reaches its best development in a strip of country between two and three miles wide immediately behind the alluvial deposit which fringes the seacoast. The present export of timber from British Guiana is in the neighborhood of 200,000 cubic feet, which, on the whole, is smaller than it was in the past, when in certain years as much as 400,000 cubic feet were exported. Greenheart is chiefly used in ship and dock building because of its immunity against the ravages of the *terado*. It is found over a range of over 240,000 square miles, or about 154,000,000 acres (625,000 square kilometers).

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[4] C. D. Mell: Quebracho Wood and Its Substitutes, *Forest Service Circular 202*, U. S. Dept. of Agriculture, Washington, 1912.

[5] C. W. Anderson: Forests of British Guiana: General Report on the Forests of the Easily Accessible Districts of the Colony. Dept. of Lands and Mines, Georgetown, Demerara, 1912.

The following tables (Tables II and III) and map (Fig. 1)[6] show in detail the different forest areas and their location:

TABLE II—FOREST REGIONS OF SOUTH AMERICA

	SQUARE MILES	MILLION ACRES	SQUARE KILOMETERS
Tropical hardwoods	1,613,000	1,032	4,177,805
Paraná pine	309,000	200	801,611
Subtropical hardwoods	259,000	165	670,761
Greenheart-mora forest	241,000	154	624,785
Mahogany forest	84,000	54	218,672
Quebracho forest	404,000	258	1,045,627
Chilean pine-beech forest	96,000	61	247,557
Total	3,006,000	1,924	7,786,818

From this very inadequate survey of the commercially valuable timber resources of South America as we know them now, it may be seen that the real forest wealth of South America is not as great as one would naturally think from the vastness of the forest area, particularly if one bears in mind that the commercial forest does not occur in a solid body over the entire area and that a great deal of it has already been destroyed. Thus in Chile, according to Federico Albert,[7] Inspector General of Forests, Hunting, and Fisheries, the commercial forest area has now been reduced to 5,000,000 acres. Of the 39,000,000 acres classed as woodland, 9,000,000 are pasture forest, 18,500,000 only firewood forest, 6,000,000 furnish only poles and stakes, leaving only about 5,000,000 acres of really commercial forest.

That light, strong, and easily workable timber is the one that is most in demand even in South America is shown by the fact that in Argentina 80 per cent of the total annual consumption of lumber is imported from the United States, Canada, and Europe, and consists chiefly of pine and spruce, while the native hardwoods make up only about 10 per cent. The same is true of Uruguay. In Brazil, where the forest area of hardwoods is very large, 40 per cent of the total consumption is covered by importations of pine and spruce from the United States, Canada, and Europe, 30 per cent is supplied by the native pines, and the remaining 30 per cent is made up of the native hardwoods. In Chile, the third in importance of the South American republics, 55 per cent of the total wood consumption is covered by American and European importations and 45 per cent supplied by the native woods.

It is true that of the 47,000,000 board feet of Paraná pine which is cut annually in Brazil, about 15,000,000 board feet is exported; yet at the same time the United States, Canada, and Europe are sending pine to Brazil, largely for similar uses, in quantities averaging over four times this

[6] In preparing the map, the boundaries of the several forest regions have been determined by W. H. Lamb, in charge of investigations on forest distribution in the Forest Service.

[7] Federico Albert: The Forests of Chile, *Monthly Bull. of Agric. Intelligence and Plant Diseases*, Vol. 5, 1914, pp. 1535-1541, Internatl. Inst. of Agric., Rome.

amount. An analysis of the export and import lumber trade of the whole of South America (see Table IV) shows a condition similar to that in Brazil. Thus, while the importations of lumber in 1912 amounted, exclusive of naval stores, to about $32,000,000, the export of wood, exclusive of rubber, was a little over $9,000,000. Of this, over half was *quebracho* extract logs. The amount of actual wood exports, therefore, was not more than $4,500,000, or about one-seventh as much as the wood imports. It is evident that at present the large forest area of South America does not even supply its home demand for soft, easily workable wood commonly used in general construction work. So much for the coniferous softwoods.

As far as hardwoods are concerned, the present annual cut is almost sufficient to cover the home demand; consequently very little hardwood timber is imported into South America from the United States, Canada, or Europe. Judging from the figures available for Brazil, Uruguay, and Argentina, the native hardwoods form only about 15 per cent of the total amount of wood used in South America, a rather insignificant amount.

At present the lumber industry of South America is still in a primitive condition. The inaccessibility of the forests, the absence of means of transportation, the lack of capital, and the sparseness of the population are undoubtedly responsible. The logging of tropical woods, even with improved methods, will always be a costly operation. Unless all of the mature trees in such a forest are marketable—a condition which can hardly be expected—the valuable species will always be found more or less scattered. To log them, therefore, will involve large expense of cutting roads to where the trees are felled. Furthermore, the tropical hardwoods are, as a rule, cumbersome to handle on account of weight. Not infrequently as many as 40 oxen are required for the transportation of one log. According to some estimates by large logging operators, it would cost $16.80 to haul 1,000 board feet for a distance of 12½ miles. As is mostly the case in all new countries, the public service transportation is expensive in Brazil. A railroad running through one of the most important forest sections charges about $15.90 per thousand feet American log scale for transporting logs a distance of 100 miles. Even in the Paraná pine region, where the timber occurs in almost pure stands, one of the sawmills with a steam-power logging road and modern power skidding and logging machinery figures the cost of logs delivered on skids at the mill at $10.50 per thousand feet, not including stumpage.

The lumber industry is working under many difficulties and is confined to a few species. This explains largely such an apparently anomalous situation as that lumber from native woods is undersold in nearly every important market by high-grade imported lumber, in spite of the fact that the native forests are only from 100 to 300 miles from the points of consumption, while the foreign lumber must be shipped from 4,000 to 5,000 miles and bears an import duty of 100 per cent ad valorem. These difficulties,

TABLE III—FOREST AREAS OF SOUTH AMERICA BY COUNTRIES (DETAILED TABLE)

	PER CENT OF TOTAL FOREST AREA	MILLION ACRES	SQUARE KILOMETERS	AREA PER 100 INHABITANTS IN SQ. KMS.
Argentina				
Chilean pine-beech-cedar forest	15.8	23	94,307	
Subtropical hardwoods	2.9	4	17,682	
Quebracho forest	81.3	120	485,681	
Total forest area	100.0	147	597,670	8.0
Bolivia				
Tropical hardwoods	51.2	93	376,050	
Subtropical hardwoods	17.7	32	129,672	
Quebracho forest	31.1	56	228,693	
Total forest area	100.0	181	734,415	29.1
Brazil				
Tropical hardwoods	76.9	760	3,076,769	
Paraná pine forest	20.3	200	801,611	
Quebracho forest	2.8	28	113,169	
Total forest area	100.0	988	3,991,549	23.0
Chile				
Chilean pine-beech-cedar forest	100.0	38	153,250	
Total forest area	100.0	38	153,250	4.4
Colombia				
Greenheart-mora forest	5.7	9	35,365	
Mahogany forest	26.4	41	165,037	
Subtropical hardwoods	39.6	61	247,557	
Tropical hardwoods	28.3	44	176,826	
Total forest area	100.0	155	624,785	12.3
Ecuador				
Tropical hardwoods	64.2	60	241,662	
Subtropical hardwoods	22.6	21	84,878	
Mahogany forest	13.2	12	49,510	
Total forest area	100.0	93	376,050	25.1
Guiana				
Greenheart-mora forest	89.3	36	147,354	
Tropical hardwoods	10.7	4	17,682	
Total forest area	100.0	40	165,036	7.2
Paraguay				
Quebracho forest	100.0	54	218,084	
Total forest area	100.0	54	218,084	25.7
Peru				
Tropical hardwoods	63.3	71	288,816	
Subtropical hardwoods	36.7	41	167,395	
Total forest area	100.0	112	456,211	9.9
Uruguay				
No forests of commercial importance, the whole country being essentially an extension of the great Argentine plain.				
Venezuela				
Greenheart-mora forest	94.1	109	442,066	
Subtropical hardwoods	5.0	6	23,577	
Mahogany forest	.9	1	4,125	
Total forest area	100.0	116	469,768	17.0

however, are being gradually overcome. The lumbering of the Paraná pine is already on a fairly solid basis and is making rapid progress. It is being developed largely by American lumbermen. At first, without fully understanding the properties of the Paraná wood, they had trouble in handling it; but gradually, as men of more technical training become interested in its manufacture and the problems connected with its kiln-drying are worked out in a practical way, an increasingly greater utilization of the timber is definitely assured. Even now in some states it is the

Fig. 1—Map of the commercially valuable forest regions of South America. Scale, 1:50,000,000. The boundaries of the forest regions were determined by W. H. Lamb of the U. S. Forest Service.

TABLE IV—IMPORT AND EXPORT LUMBER TRADE OF SOUTH AMERICA, 1912*

(values in dollars, United States currency)

IMPORTS

	FURNITURE	PINE UNPLANED	WOOD		ROSIN	PINE BLOCKS AND BOARDS	STAVES AND HOOPS	ROUGH, SAWED, PLANED, AND VENEERED	LUMBER AND WOODS	TURPENTINE	MATCHES	TOTAL LUMBER	NAVAL STORES
			UNMFG.	MFG.									
Argentina..	2,668,230	13,984,340	......	......	......	......	......	......	......	......	......	16,652,570	....
Bolivia.....	130,702	......	248,087	75,794	......	......	......	......	......	......	......	454,583	....
Brazil......	871,002	......	......	......	1,593,017	2,768,805	186,883	464,835	......	......	......	4,291,525	1,593,017
Chile.......	......	1,331,773	......	......	......	......	......	......	......	......	......	1,331,773	....
Colombia..	......	......	......	......	......	......	......	......	317,401	......	......	317,401	....
Ecuador...	......	......	......	......	......	......	......	......	94,594 [a]	......	26,917	121,511	....
Guiana													
British..	.....	......	......	......	......	......	......	......	3,846,701	......	......	3,846,701	....
Dutch...	......	......	......	......	......	......	......	......	......	......	......	....	....
French..	......	......	......	......	......	......	......	......	......	......	......	....	....
Paraguay..	4,835 [b]	......	......	......	......	......	......	......	......	......	......	4,835	....
Peru.......	171,631 [c]	......	......	......	......	......	......	......	1,765,916 [c]	......	......	1,937,547	....
Uruguay...	258,841 [c]	......	......	......	......	......	......	......	2,680,597 [c]	......	......	2,939,438	....
Venezuela.	......	......	......	......	......	......	......	......	......	8,879	......	....	8,879
Total..	4,105,241	15,316,113	248,087	75,794	1,593,017	2,768,805	186,883	464,835	8,705,209	8,879	26,917	31,897,884	1,601,896

[a] Rough and finished. [b] Only U. S. reported. No figures for other countries. [c] 1911.

EXPORTS

	QUEBRACHO		TIMBER	WOOD AND LUMBER	BALSAM COPAIBA	QUILLAYA BARK	BALSAM TOLU	TOTAL
	EXTRACT	LOGS						
Argentina..	4,667,570	3,443,655	......	......	......	......	......	8,111,225
Bolivia....	......	......	......	......	......	......	......	......
Brazil......	......	......	......	......	......	......	......	......
Chile.......	......	......	......	......	......	9,287 [a]	......	9,287
Colombia..	......	......	68,572	15,289	5,910 [a]	......	19,488 [a]	109,259
Ecuador...	......	......	......	......	......	......	......	......
Guiana								
British..	......	......	62,830	......	......	......	......	62,830
Dutch...	......	......	......	9,839 [b]	......	......	......	9,839
French..	......	......	......	......	......	......	......	......
Paraguay..	......	......	846,341	......	......	......	......	846,341
Peru.......	......	......	......	......	......	......	......	......
Uruguay...	22,747 [b]	......	......	......	......	......	......	22,747
Venezuela..	......	......	......	72,439	38,658	......	......	111,097
Total..	4,690,317	3,443,655	977,743	97,567	44,568	9,287	19,488	9,282,625

[a] Exported to United States. No figures for other countries. [b] 1911.

* From "Commercial Relations of the United States with Foreign Countries, Calendar Year 1912," Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, 1914.

most formidable competitor of Scotch pine, American spruce, and white pine for box making. In southern Brazil it successfully replaces the American yellow pine for doors, flooring, blinds, and ceiling. There seems, therefore, to be very little doubt that in Paraná pine South America has a softwood which can successfully take the place and therefore compete with the softwoods imported from the United States, Canada, and Europe, and that with the greater development of the native lumber industry the importation of the softwoods to South America will gradually decrease and that eventually she will be able to supply her own demand for this kind of timber.

The limited area, however, of these pine forests, together with the fact that South America is still a young country which will have to provide wood for a much larger population than she has now, makes it very doubtful that even with the proper protection and management she will ever become an exporter of softwoods to foreign markets. With regard to hardwoods, however, South America, in spite of the difficulties of primitive methods in logging, is already capable of satisfying practically all of her needs and is even exporting, in addition to extract and dye wood, some of the rarer woods. The vast hardwood forests of South America could undoubtedly be a source of large supplies of tropical hardwoods for interior finish for the world market, if it were not for the fact that the demand for heavy tropical woods will always be limited, and even the use of dye woods is probably coming to an end shortly because of the progress made with chemical dyes. Furthermore, the weight of the tropical woods and the distance from markets will always be a serious obstacle in delivering such woods on a large scale at reasonable prices, especially at a time when wood is coming more and more into competition with wood substitutes. Therefore, unless the South American hardwoods are to be manufactured on the ground and exported as veneer or other partially manufactured product or the cost of logging and transportation is greatly reduced, they will hardly ever become a source of great export.

If our estimates of the timber resources of South America are anywhere correct, several conclusions suggest themselves:

First, in spite of apparently a vast forest area, the extent of commercially really valuable timber is limited, and therefore it would be an obvious error to assume that the timber resources of South America are inexhaustible. The people of the United States have made a similar error in the past. Twenty years ago the white pine in Michigan was regarded as inexhaustible; today 6,000,000 acres which thirty years ago carried the best white pine in the world have been abandoned by their owners for taxes and lie almost wholly waste—a man-made desert, the combined result of a reckless use of the axe and a still more reckless disregard of fire. As it is, attention has already been repeatedly called to the danger of the extinction of the *quebracho,* since little or no check has been placed on the cutting

of this wood. If the present cutting is permitted to continue, according to a very high Argentine authority, few existing *quebracho* trees will be left standing. There is constant outcry for the passing of immediate forestry laws, but as yet this very pressing matter has not obtained its share of consideration from Congress. Not only the *quebracho,* but many other valuable species of trees with which the forests abound are in danger of extinction in the not very distant future as the result of inadequate forestry laws.

Second, the coniferous softwoods of South America will supply only the growing home population, and, therefore, their preservation becomes a matter of national importance, since with the gradual exhaustion of the timber supply of the northern and temperate regions the amount of softwood exported will gradually decrease and the price increase.

Third, South America has a vast amount of hardwoods which is more than sufficient to supply her own needs for all time; but, as far as we know at present, it has comparatively few hardwoods beside Spanish cedar and several extract and dye woods which may figure extensively in export trade. This vast hardwood forest is still unknown and furnishes a fertile field for exploration which may lead to the discovery of many species whose wood properties may change entirely the commercial aspect of the South American forests. The first task, therefore, of South American countries which are interested in the development of their forests is a thorough reconnaissance of their timber resources and a study of the technical properties of the different woods as a basis for an intelligent estimate of what those forests contain and what they have to offer to the lumber market of the world. If further study fails to discover any more valuable species than those already known it will still serve as a basis for a definite forest policy. It will indicate methods of logging and partial manufacture which may make possible a large export trade in these hardwoods. It may show the advisability of confining future management of those forests to the growth of only the most valuable species and the gradual elimination of the vast number of unutilizable trees or forest weeds. Such a policy, together with the rapid growth of the tropical trees, may tend to increase the commercial value of the forests. It may also dictate a definite land policy with regard to the clearing of certain kinds of forests for agricultural purposes and the advisability of retaining others for timber growth. Without such a reconnaissance and determination of the possible uses to which the tropical hardwoods are suited, a systematic and intelligent development of the timber resources can not be undertaken nor capital for their exploitation readily attracted. It is therefore in the interest of the countries whose economic progress depends on the development of their natural resources that such a reconnaissance should be undertaken and carried through as soon as possible.

THE MISSION RANGE, MONTANA

By W. M. DAVIS

Location and General Features. The Mission Range, one of the smaller members of the Rocky Mountains in western Montana, has the appearance, as seen from the west, of a gently tilted and moderately dissected fault block, gradually rising southward through its 70 miles of length, and believed to be composed of deformed rocks, mostly quartzites, of so uniform a resistance that no distinct expression of inner structure is recognized in outer form. It occupies the greater part of the distance between the Northern Pacific and the Great Northern Railways on the 114th meridian west of Greenwich. The steeper face of the range, probably representing the battered fault scarp, looks to the west. At the low northern end the moderately uneven crest emerges from beneath the glacial deposits which floor the broad intermont depression thereabouts at an altitude of 3,000 feet and rises slowly southward to a height of 9,800 feet near an abrupt southern descent, there gaining a maximum local relief of nearly 7,000 feet. The eastern side of the range is said to slope gently; the western face is steep. Thus the slowly rising crest and the long eastern slope suggest that the mountain block is an up-faulted fragment of a formerly worn-down mountain region, perhaps of low enough relief to be called a peneplane. Several other mountain masses in the same region exhibit a widespread accordance of summit altitude and thus support the conclusion that the forms of today are carved in the uplifted surface of a worn-down mountain region.

The mountain crest, slowly descending and dwindling away to the north, wedges off the branch intermont depression of the north-flowing Swan River on the east from the much larger and longer intermont depression of the south-flowing Flathead River and Lake on the west (map, Fig. 1). This depression is the southernmost part of the Rocky Mountain Trench, as it has been called by Daly.[1] In the district here concerned, the depression is limited on the east by the strong slope of the Galton and Swan Ranges of the Rocky Mountains and on the west by the more gentle ascent of the Flathead Mountains. On the gravel and silt plains of the depression, north of the lake, lies the flourishing agricultural town of Kalispell (altitude, 2,950 feet), reached by a southwestward, 15-mile spur from the main line of the Great Northern Railway. On the eastern shore

[1] R. A. Daly: The Nomenclature of the North American Cordillera Between the 47th and 53rd Parallels of Latitude, *Geogr. Journn.*, Vol. 27, 1906, pp. 586-606; see p. 596.

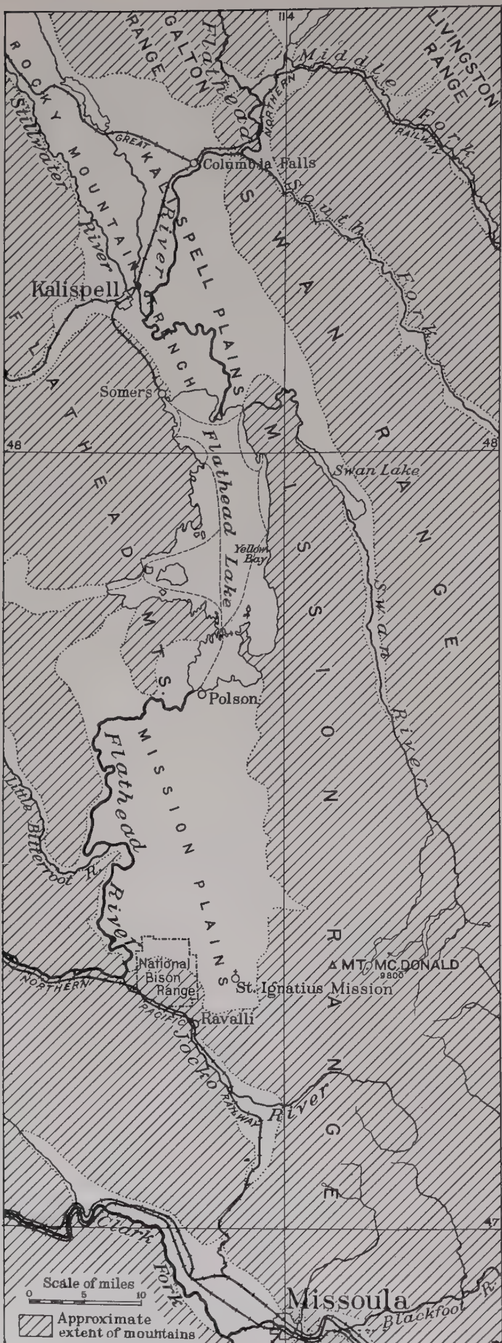

FIG. 1—Sketch-map of the Mission Range region, Montana, with the Flathead intermont depression. Scale, 1:1,100,000.

of Flathead Lake beneath the lower northern part of the Mission Range is the University of Montana Biological Station, the director of which, Professor Morton J. Elrod, has explored the district and published several essays upon it, in which the origin of the range by faulting and its glaciation are briefly mentioned.[2]

My own acquaintance with the Mission Range is brief. In connection with a Shaler Memorial Study in August, 1913, I took a rapid trip 80 miles southward from Kalispell and return and made many notes and sketches of the mountain forms as seen from the lake and plains on the west at distances of one to five or more miles. The diagrams here presented are redrawn from my hurried outlines and represent the range as if it were seen from an elevated point of view several miles to the west. They are roughly generalized figures, suggestive of the kinds of forms there exhibited, rather than sketches of actual details; they undoubtedly exaggerate certain features; they are bare of vegetation; their uncompromising black lines cannot portray the soft-

[2] The Beauties of the Mission Range, *Rocky Mountain Mag.*, 1901, pp. 623-631.

A Biological Reconnaissance in the Vicinity of Flathead Lake, *Bull. Univ. Montana: Biol. Series No. 3*, 1902, pp. 91-182.

The Physiography of the Flathead Lake Region, *ibid.*, No. 5, 1903, pp. 197-203.

ness of the graded slopes; the diagrams are indeed hardly more than caricatures of the picturesque reality; yet if allowance is made for their limitations they may serve to make the following text and the photographs more easily intelligible. The photographs come from the collection of the U. S. Geological Survey, to which my thanks are hereby rendered; some of them are by Dr. C. D. Walcott, others by Mr. R. W. Stone. Their accuracy is delightful, and the abundance of detail in certain views is extraordinary; but the relation of the parts that they so well represent to the whole of the range is nevertheless aided by the rough diagrams.

FIG. 2--The three belts of the Mission Range.

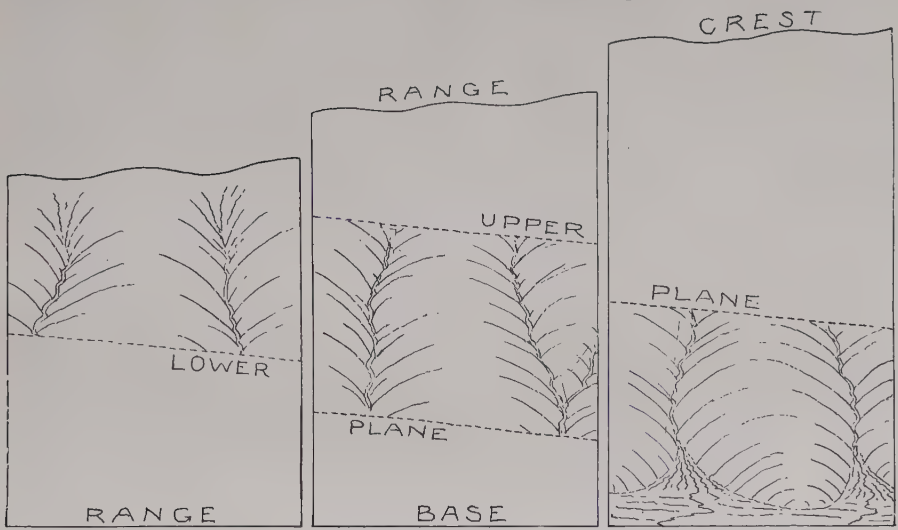

FIG. 3—The normal features of the middle belt.

The Three Belts of the Range. The present features of the Mission Range, as seen from the intermont depression on the west, may be divided, in so far as they are due to erosion since uplift, into three oblique belts, as in Figure 2, by two planes slanting gently to the south and about 1,000 feet apart. Through the middle of the range where the limiting planes overlap all three belts are represented.

The Middle Belt. In the middle belt, confined between the two planes, the mountain-side forms are all due to the normal erosional forces of weather and water. Owing to the overlap of the planes, a continuous descent cannot be made at any one point within this belt from mountain crest to mountain base; the overlap is indeed so great that portions of the belt must be taken, as in Figure 3, at three places in order to show a spur

summit and valley heads as on the left, the mid-descent of a spur and valleys as in the center, and a spur end and piedmont fans as on the right. The crest of the range here shows rounded, waste-covered summits; the slope is diversified by maturely graded, large-textured, full-bodied spurs between the wide-spaced, steep-pitching, apparently consequent valleys of small and rapid streams. The summits and a good part of the graded spurs are treeless. As is usual in forms of this kind the rarity of rock outcrops makes outline sketching difficult; there are not enough lines to express the forms. The concave forward reach of the tapering spurs as they blend into the piedmont plain is far beyond my power of black-line representation in a front view. The well-rounded forms of the spurs suggest that the inferred original fault-scarp of the supposed mountain block is completely destroyed by retrogressive erosion; and, if so, the upper parts of the streams should be regarded as obsequent extensions of the original consequents, inasmuch as they must now discharge to the westward a certain amount of rainfall captured from formerly longer east-flowing consequents. There is no trace of spur-end facets along the western mountain border, such as characterize the up-faulted and less dissected Wasatch Range in Utah; the valleys, instead of preserving their V cross-section to a simple base line, as in the Wasatch, open on fans that form re-entrant cusps between the advancing scallops of the spur ends. What relation exists between the rock structure and the scalloped base line I cannot say.

A characteristic feature of the maturely carved middle belt is the well-organized system of down-hill lines by which the descent of water and waste is made from any point on the slope to the mountain base. All the paths of descent first follow the down-hill element of a well-graded spur

FIG. 4—Northern end of the range emerging from the plains.

side to a stream; then the down-valley element of a stream course to the piedmont plain. The spur-side elements are countless; contiguous elements are nearly parallel to one another, being but slightly convergent or divergent; their declivity changes so slowly and systematically as to insure a steady though very deliberate progress of the continuous waste cover, as it creeps and washes toward a stream. The stream lines are comparatively few, probably not more than eighty or one hundred in the three southern quarters of the range length where streams are normally developed. The rock waste, slowly fed from the spur sides into the streams, is rapidly washed down the channel to the mountain base; for, as well as I could see, the channels seem to be fairly well graded, though they doubtless still retain many little rocky rapids and bouldery pools; and their declivity appears to be such that the streams gain just the velocity that enables

them to do their work of transporting the waste received from the spur sides, with a very small addition supplied by corrasion of beds and banks. The only down-hill lines that do not join a stream are those that follow a spur axis, and these are the lines along which the ascent of the slope is most easily made: their declivity is greatest near mid-height but seldom over 30°, and is much less than that for some distance above the base and below the top.

The Low Northern Belt. In the lower northern belt the smoothly flowing, waste-covered forms of the middle belt are replaced by uneven forms of small texture—bare crags and knobs, cliffs and ledges, channels and hollows—due to recent and severe but immature scouring by a broad and overwhelming glacier of Canadian origin. Similarly immature crags and knobs occur in the glaciated areas of central France[3] and North Wales.[4] Tree growth on the craggy slopes here seen is more abundant than on the waste-covered spurs of the middle belt, and a good share of the surface is thus concealed; but the bare and uneven ledges are so plentifully visible that I felt no doubt of their extending under the tree cover as well. Outline sketching is, however, again difficult because the innumerable rock outcrops now provide details so abundant that there are too many lines to draw; needless to say that the knobs and cliffs shown in my diagrams are not minutely accurate copies of actual forms.

The northern half of this belt forms the northern quarter of the range and lies entirely beneath its limiting plane, as in Figures 4, 5, and 6; it has

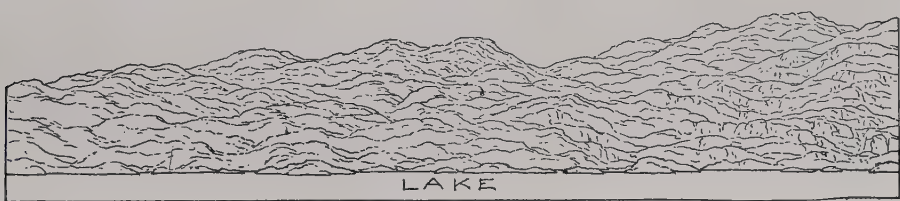

FIG. 5—The gradual rise of the scoured northern belt.

an arbitrarily uneven crest, the profile of which lies beneath the northward prolongation of the non-glaciated crest in the middle belt by one or several hundred feet, as if worn down by glacial scouring. The side slope of rubbed and roughened hills and hollows is a medley of unorganized forms; it has no sign of the well-arranged lines of continuous descent by which the middle belt is characterized and no indication of the delicate interdependence of parts that Gilbert long ago, in his classic report on the Henry Mountains, showed to be an essential characteristic of streams and surfaces that had been long enough exposed to the normal processes of subaërial erosion for the development of mature drainage systems: naturally not, for

[3] W. M. Davis: Glacial Erosion in France, Switzerland, and Norway, *Proc. Bost. Soc. Nat. Hist.*, Vol. 29, 1900, pp. 273-322; reference on p. 276.

[4] W. M. Davis: Glacial Erosion in North Wales, *Quart. Journ. Geol. Soc.*, Vol. 65, 1909, pp. 281-350; reference on p. 336.

the irregular slopes here seen are not the work of d-wn-hill washing and creeping by water and weather, but of side-hill scouring and plucking by a huge glacier, moving almost horizontally southward and at so recent a date that small advance toward the development of normally carved forms and toward the establishment of well-organized drainage systems is yet to be seen. There appears, however, as far as I could make out by repeated examination with a field glass, to be some talus at the foot of cliffs and some smooth flooring of detritus gathered in the hollows and there may be small gorges cut in rock sills by the plunging streams. The lines here followed by falling, rolling, and creeping waste are short, irregularly disposed, and of rapidly changing declivity; they radiate in all directions from countless knobs and hillocks, they converge in all directions toward countless channels and hollows: the lines followed by leaping and lagging streams are frequently deflected almost parallel to the range front, in one direction or the other, as if following small troughs worn along the face of the mountain slope; the streams must therefore turn this way and that, they must alternately hurry and loiter, striving to wear down ledges that are too steep and to fill up sags that are too flat, the latter task probably being farther advanced than the former. Streams thus arranged form an elabo-

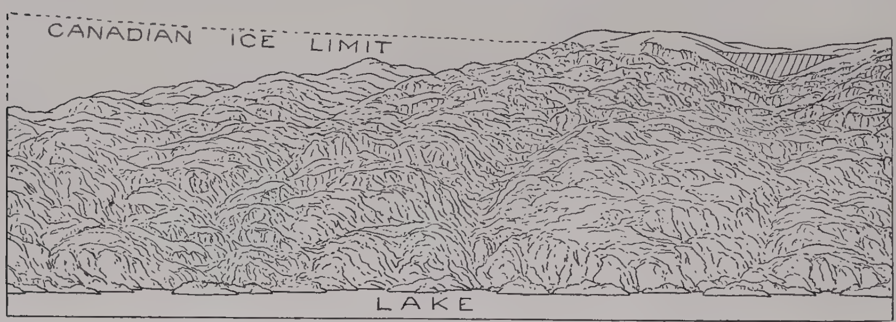

FIG. 6—The scoured northern belt overlapped by the middle belt.

rate branch work; Y-junctions are very frequent, the stems of the smaller upper y's forming the branches of the next lower and larger ones, over and over again. As a result no direct stream lines for the descent of water and waste from the range crest are seen here, and no continuous spur axes to guide paths of direct ascent from the range base. The branch-work stream system thus constituted stands in strong contrast to the single-line streams of the normally eroded middle belt; yet the branch-work streams as well as the single-line streams are consequent, in the sense of following courses offered to them when taking possession of the surfaces that they drain; their differences are chiefly due to difference in the nature of the surfaces offered to their action, and for the rest to differences in their stage of development; for the single-line streams are almost mature, while the branch-work streams are very young: but all this contrast is implied

in saying that the northern end of the range shows "uneven forms due to recent and severe but immature scouring by a broad and overwhelming glacier."

Northern End of the Range. If the range is followed farther north, as in Figure 4, its height decreases with a somewhat regular irregularity until the last visible knobs, deeply scoured and channeled and plucked, more or less detached from one another, rise hardly a hundred feet above the surrounding plain of out-washed glacial gravels and silts diversified by low morainic hills, which here occupies the broad intermont depression and presumably covers a farther northward extension of the range crest underground. Some of the knobs lie somewhat west of the line that farther south follows the mountain base, and this suggests that the strong fault by which the central and southern part of the range is thought to be limited, may here, near the least uplifted end of the mountain block, be represented by an up-warped or up-arched mass of which the western limb corresponds to the underground wing of the fault farther south. Low as the range is here, the rocks of the knobs are resistant and apparently of the same nature as those which form the lofty mountain crest to the south. Evi-

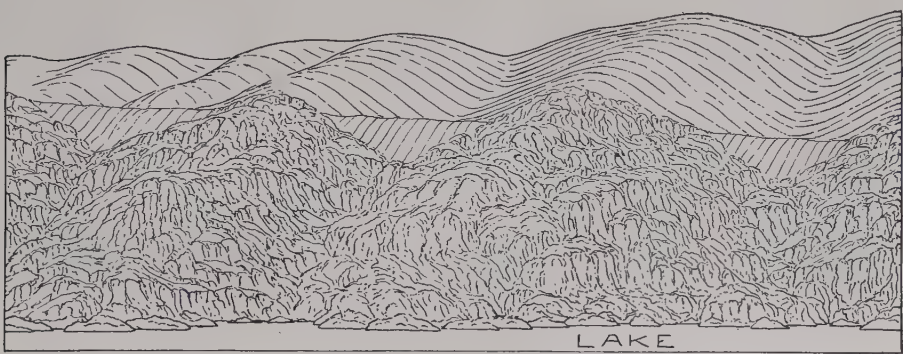

FIG. 7—Morainic embankments between normal summits and scoured slopes.

dently, then, the northward diminution of range height cannot be due to degradation of a once much loftier mass in the present cycle of erosion, but rather to the northward decrease in the uplift of a previously worn-down mass. The range rises highest where the uplift, increasing southward along the edge of the supposed fault block, has its greatest value.

A curious feature of the trailing northern end of the range is its transection by the Swan River, which, instead of making a northward detour and avoiding all the rocky knobs, takes a short cut westward through them on its way from its own valley on the back-slope side of the Mission fault block to the larger Flathead valley on the fault-scarp side. This is presumably a persistent consequence of temporary constraint by the waning mass of the Canadian glacier; if so, search should be made in notches at higher levels in the trailing crest for transverse water-worn channels marking temporary

outlets of a proglacial lake in the upper Swan River valley; and it is quite possible that the highest channel of all may occur at the head of the valley westward around the southern end of the Mission Range or southward over the neighboring hills directly into the valley of Jocko River.

Truncated Spurs and Morainic Embankments. If we now turn southward to the second fourth of the range, where its crest rises above the limit of glaciation, as in Figure 6, the normally rounded summits and the normally hollowed valley heads of the middle belt make their appearance above the rugged slope of glacial erosion. The valleys are barred across by what I take to be morainic embankments (Figs. 7 and 8), which record the height of glacial action to a nicety; the spurs are imperfectly truncated in irregular cliffs and ledges, strongly scoured along the mountain side.

Below the gently slanting line defined by the moraines, the disorderly tumult of bare cliffs and ledges in the imperfectly truncated spur ends forms a striking contrast with the subdued orderliness of the waste-covered higher slopes; the subdued forms of large texture express a long and suc-

FIG. 8—Normal slopes above scoured slopes.

cessful continuity of degradational processes; the disorderly forms of small texture express a striving and unsuccessful discontinuity. Above, all the local variations of rock structure, such as are determined by the composition, thickness, and attitude of successive beds and by the number and inclination of joints, are practically without influence upon the form of the surface, because local and individual influences are masked by the generalizing effect of the creeping cover of rock waste; below, the masses and planes of structural strength and weakness are strongly expressed in the bared rock faces and fissures of the many cliffs and benches.

The streams in this fourth of the range exhibit a haphazard habit in their plunging courses, for the valleys as well as the spurs are largely obliterated below the line of moraines. Cascades and pools must be frequent in watercourses that are consequent on the smaller forms of so rocky and rugged a mountain side; as far as I could see, little progress towards

establishing a graded profile has been accomplished. In the absence of pronounced spurs and valleys, the whole mountain side here descends like a battered wall and dips under the waters of Flathead Lake, of which the eastern shore line is comparatively simple when viewed as a whole but minutely irregular when viewed in detail. The western shore line is much more sinuous. There are, however, two eastern re-entrants of small size, Woods and Yellow Bays, roughly represented in Figures 7 and 8, which appear to occupy scoured hollows between spur remnants, but as to this I am uncertain; the buildings of the Biological Station of the University of Montana are beautifully situated on the north side of Yellow Bay, where a gravel delta, not shown in the diagram, now occupies part of the original re-entrant.

As one advances farther southward, some of the morainic embankments are trenched by the streams from the normal valleys behind them, as in

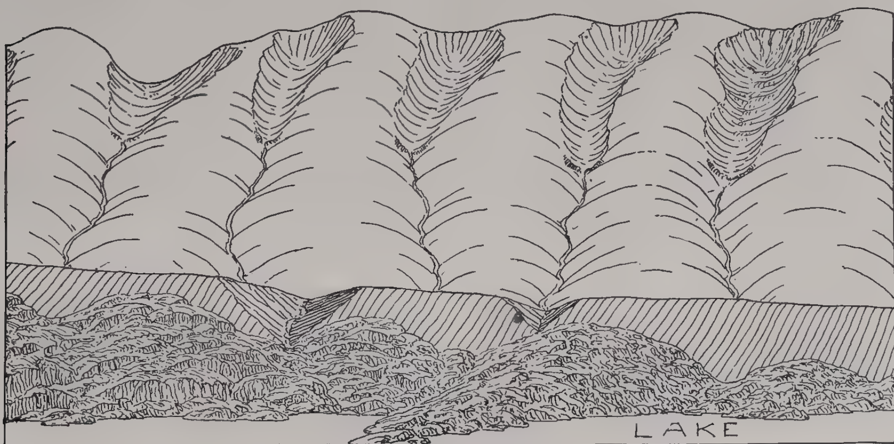

FIG. 9—Small cirques above a continuous moraine.

Figure 9, the spur ends are scoured to less and less height, and their truncation is less and less effective; one of the spurs advances in a low promontory and is continued across the lake by a string of small islands, one of which is shown in Figure 16. The ruggedness of its nearby rocks justifies the generalized details of the glaciated slopes in Figures 7, 8, and 9, although such details are not shown in the photographic view of the range from one of the rocky islands (Fig. 18). Farther on still, the embankments stand at less and less heights above the lake and at the same time become larger and longer, until they ride over the spurs and thus form a long unbroken ridge, which gradually departs from the base of the range, as in Figures 9 and 10. The morainic ridge in this part of its length is truly only about half as high as the 1,500-foot embankment that forms the northern side of the huge morainic amphitheater in which the ancient glacier that followed the valley of the Dora Baltea from the southern side of the Mt.

Blanc group ended on the plains of Italy at Ivrea; nevertheless it constitutes a formidable monument of glacial construction, which becomes especially conspicuous as it swings away from the mountains in the noble terminal moraine, dotted with boulders, that sweeps westward across the intermont depression with a relief of 400 or 500 feet—see Figure 2—and a breadth of one or two miles, separating Flathead Lake on its concave northern side from the Mission Plains, chiefly composed of earlier glacial deposits, on its convex southern side. The lake outlet follows a trench sharply cut across the moraine at the southwestern angle of the lake; the town of Polson lies on the morainic slope next east of the outlet, and gives its name to the moraine.

The truncation of mountain-side spurs by a passing glacier is of familiar occurrence in the valley troughs of formerly glaciated mountain ranges; it is less familiar as a feature of ranges that border broad intermont plains.

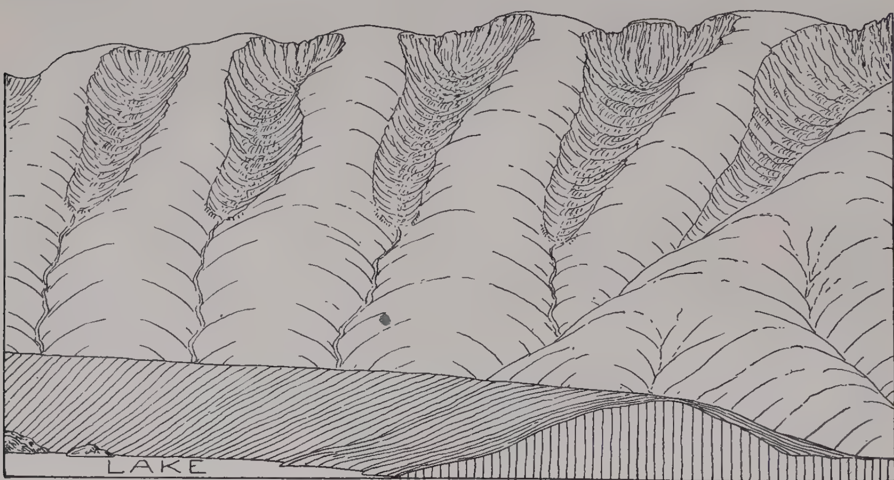

FIG. 10—Larger cirques: the moraine curves westward.

Yet another example of such truncation occurs not far away to the northeast, where the flanks of the Galton and Swan Ranges, the former far northward and the latter for some ten or fifteen miles south of the deep notch by which the Great Northern Railway enters the mountains from the broad intermont depression a short distance east of Columbia Falls station, bear conspicuous marks of scouring by the broad Canadian glacier, similar to but larger than those left upon the flanks of the Mission Range. Near the railway notch the terminal facets of the truncated spurs may well rise a thousand feet over the plain; but they rapidly decrease in height southward, and, beyond the last and lowest one, many other spurs trail away with long concave slopes into the intermont plain: it therefore appears that the farthest effect of the Canadian glacier along the mountain base is seen in the last spur-end facet.

The High Southern Belt. Several miles before the long morainic embankment turns west from the base of the Mission Range at the southern end of the low northern belt, the valley heads show cirque-like enlargement, as in Figures 8 and 9, and thus define the beginning of the third, or high southern belt. Unlike the other two belts, in each of which the sculpture is all of one kind—all normal sculpture in the middle belt, all glacial sculpture in the northern belt—the features of the southern belt are of two kinds, normal and glacial; but here the features of glacial sculpture are the work of separate local glaciers, each in its own valley, and the resulting cirques and troughs alternate with summits and spurs of normal erosion. The first cirque—see Figure 8—is so faintly developed that, were it seen alone, one might remain uncertain as to its nature; but there can be no doubt as to

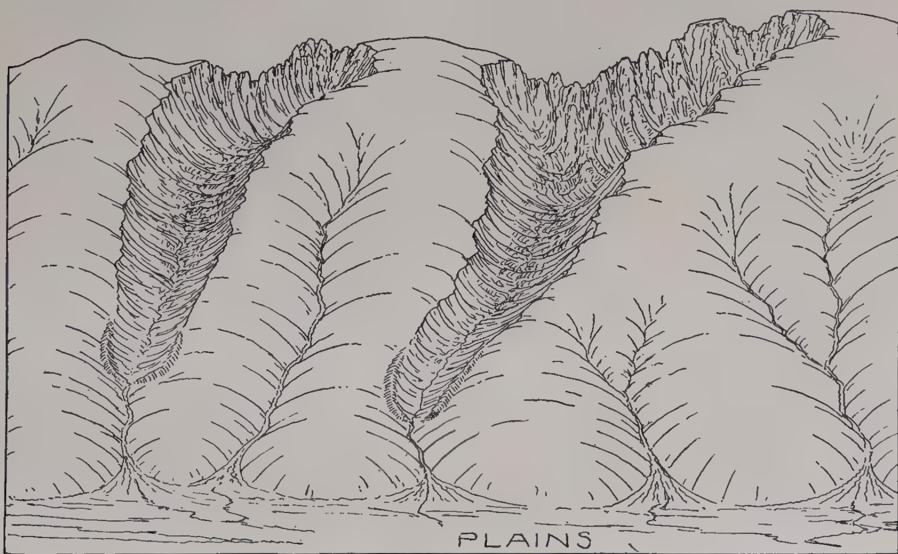

Fig. 11—Sharpened crests between opposing cirques.

its being the slight enlargement of a normal valley head by a small local glacier when it is seen as the northernmost recognizable member of a systematic series of twenty-five or more, of which the southernmost (Fig. 13) is a huge cliff-rimmed excavation in the mountain top, at least 1,000 feet deep, opening into a great rock-walled, hollow-floored trough that descends 5,000 feet to the mountain foot, where it is looped around by a beautiful though small terminal moraine. A line drawn through the lower end of all the troughs separates the middle belt from the high southern belt.

The normal features of the southern belt differ from those of the middle belt only in size and in completeness of development. They are large enough to extend through the entire height of the mountain side. Some of the spurs are subdivided by valleys of normal form that head at half or three-quarters mountain height, and therefore too low for the development

of cirques at their head; but other spurs continue undivided from mountain crest to mountain base. With increase of summit height southward, the spurs are more and more encroached upon by the intervening cirques and troughs, but the two classes of forms do not blend; they are separated by well-defined edges where the convex, waste-covered, normal form is suddenly undercut by the steep rock wall of the glacial excavation. The close association in which the two classes of forms are here seen adds force to the objections that I have elsewhere urged[5] against the empirical German phrase-words *Mittelgebirgsformen* and *Hochgebirgsformen*—that is, forms of middle-height mountains and of high mountains—as designations for features of the two classes which are here so intimately associated at the same

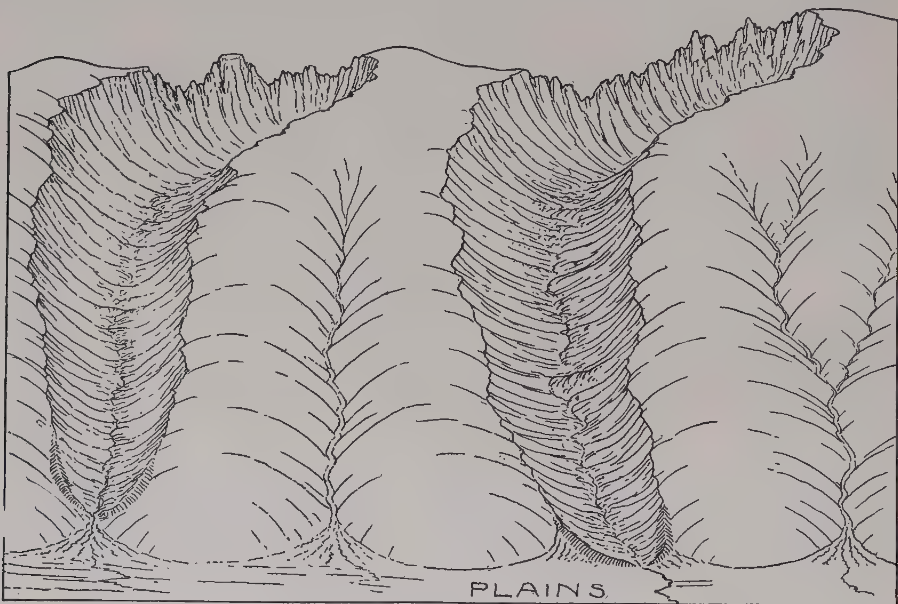

FIG. 12—The cirques are enlarged southward.

altitude; and the confidence with which the two classes are here distinguished gives renewed warrant for preferring explanatory phrases, like forms of normal and of glacial sculpture, to empirical phrases, such as round-topped and sharp-crested mountains.

Cirques and Troughs of Local Glaciers. It has surprised me on various earlier occasions to note the ease with which high-standing cirques can be made out at distances of several miles; from five to twenty miles in the Wasatch Range in Utah[6] and in the Front Range of Colorado,[7] from thirty to forty miles with a field glass in the higher ranges of Turkestan[8]; but

[5] Die erklärende Beschreibung der Landformen, Teubner, Leipzig, 1912, p. 286.

[6] The Wasatch, Canyon, and House Ranges, Utah, *Bull. Mus. Comp. Zool.*, Vol. 49, 1905, pp. 15-58; reference on p. 22.

[7] The Colorado Front Range, *Annals Assoc. Amer. Geogrs.*, Vol. 1, 1912, pp. 21-83; reference on p. 56.

[8] A Journey in Turkestan, pp. 23-119 (reference on p. 91) in R. Pumpelly's Explorations in Turkestan, *Carnegie Inst. Publ. No. 26*, Washington, 1905.

only in the Mission Range has the recognition of cirques at a distance been facilitated by their arrangement in a regularly progressive series of two dozen or more, in which larger and larger, stronger and stronger examples follow in regular procession through a stretch of forty miles. The series begins with smooth-contoured, valley-head hollows, perhaps a quarter mile in length and less in breadth, which, as above indicated, hardly deserve the name of cirques. As one's view is turned southward, the size of the hollows gradually increases, the head and side walls become steeper, with a greater exposure of base rock, as in Figure 9; farther on, as in Figure 10,

FIG. 13—An alpine crest and a piedmont lake.

the sky line of the head walls becomes notched, as if two opposing cirques had eaten through the convex crest of the mountain and locally converted it into a sharp and ragged edge, the beginning of maturity in glacial erosion of this kind; at the same time the troughs increase in length. These features characterize the parts of the range shown in Figures 15 and 17, looking across the plains south of Flathead Lake to the east and southeast. As the range increases in height a tendency is noted to the enlargement of the cirques southward, as if in exemplification of the rule that glaciers are best developed on shaded slopes[9]; and as the enlargement becomes more pronounced an extension of the maturely sharpened sky line is perceived through a greater length of mountain crest, as in Figures 11 and 12;

[9] G. K. Gilbert: Systematic Asymmetry of Crest Lines on the High Sierras of California, *Journ. of Geol.*, Vol. 12, 1904, pp. 579-588.

here the Alpine term, arête, may be well applied. With the fuller development of the cirques, the troughs gain strongly oversteepened walls and increase so greatly in length as to extend far down toward the foot of the range. The oversteepened walls have, as above noted, a sharply defined edge where they undercut the convex spurs; the bare rock, here and in the cirques exposed to free attack of the weather, is assuming minutely irregular forms and furnishing detritus to talus slopes and fans that are invading the rock floors below, but as far as I could see the change thus accomplished is small as yet. The emphatic definition of the mature cirques is strikingly unlike the vague limitation of the mature normal valley heads, and the acute

FIG. 14—Normal forms at the southern end of the range.

edge of mature arêtes, where only a narrow belt is exposed to weathering, is strikingly unlike the ample arch of the normally rounded mountain crest, where a broad belt is exposed to weathering; but both these unlikenesses are expectable in view of the fact that a mature glacier is of greatest size close to its high-level source, while a mature stream at its source is of smallest size. The broadly concave form of the troughs is strongly contrasted with the narrow concave of the normal valleys, and this contrast is intensified when one realizes that the proper homology of the large-featured glacial troughs is really found in the minute stream channels that are entrenched within the narrow valley concaves. Here one may realize the contrast between the sluggishness of a heavy glacier that nearly fills its wide and deep trough and the nimbleness of a slender stream that carries away all the ice water in a minute channel; here one may recall the comparison between mountain-

side glaciers, which in a temperate climate dwindle and disappear as they creep from snowy reservoirs down into a milder zone, with mountain-side streams, which in an arid climate wither and vanish as they run from the rainier summits down into the drier lower air.

Culmination of the Range. With continued increase in range heights, the southward enlargement of the cirques becomes so great that from a front view a large part of their interior is hidden, as in Figure 12. Finally, at the slowly attained culmination of the range close to its southern end, the largest and last cirque of the entire series is a formidable cavity, excavated half a mile or more southward of its discharging trough; and a small glacier is reported as lying concealed in the cirque head. Here the highest cirque wall, a great mass of bare rock, rises to an acutely serrate crest, forming in Mt. McDonald, 9,800 feet altitude, the loftiest peak of the range, near which the views reproduced in Figures 19, 20, and 21 were taken. The sky line of Figure 19 illustrates the simple crest of the range where it is not narrowed and notched between encroaching cirques, while the great rock face in the same view gives warrant for the steepness and ruggedness of the cirque and trough walls, as shown in the diagrammatic figures. The floor of the McDonald cirque is not in sight from the plain. The trough is a huge channel, rock-walled and rock-floored, with a fairly mature cross-section of catenary pattern. On either side the rounded spurs of normal sculpture are as typically convex as the trough is concave. The hollowed trough floor is not yet much encumbered, as far as I could determine, with talus fans; its longitudinal profile is somewhat broken by rock sills; whether rock basins occur also I could not see. The dimensions of the trough decrease as it descends the mountain side, but it is still well developed to the very foot of the range, where it is extended on the piedmont plain in the form of a terminal basin, rimmed by a well-formed terminal moraine. Farther to the south only normal forms (Fig. 14) are seen as the range rapidly declines toward the Jocko River in a long sunny slope.

The last member in the long succession of forms due to the local action of single glaciers is a fully developed example, beyond which an increase in size is possible but not an increase in completeness of detail; for between the cirque walls which rise to sharpened peaks and the trough which ends at a piedmont moraine is included the whole range of features that a single local glacier can produce. When, in addition to the features due to local glaciation in the high southern belt, are added those due to general glaciation in the low northern belt and both are viewed in their suggestive contrast with the normal features of the middle belt, the Mission Range is seen to be highly flavored with the spice that comes from variety. The concise and systematic combination of these varied features makes the range, as far as I have seen and read, unique.

FIG. 15.

FIG. 16.

FIG. 15—Southern part of Mission Range across Mission Plains. (Photo by R. W. Stone.)—Continuous with Figure 17.

FIG. 16—A scoured island in Flathead Lake. (Photo by R. W. Stone.)

FIG. 17.

FIG. 18.

FIG. 17—Southern part of Mission Range across Mission Plains. (Photo by R. W. Stone.)—Continuous with Figure 15.

FIG. 18—Glacial troughs in Mission Range over Flathead Lake. (Photo by R. W. Stone.)

Cycles and Episodes of Glacial Erosion. Large as the McDonald cirque is, it does not represent the completion of a glacial attack upon a mountain mass; that demands a relatively rapid widening of the cirque floor and its slower lowering until the enclosing walls are consumed—the action of the weather on exposed surfaces here aiding the action of ice on covered surfaces—and the mountain mass is truncated; at the same time the thickness of the ice on the truncated surface should diminish by reason of lessening mountain height and consequently decreasing snowfall, until the thin and relatively inert glacial veneer almost or quite disappears, the glacial tongues descending from it shorten and vanish, and the truncated mass remains subject only to normal dissection by the retrogressive erosion of its flanks. Here the analogy with stream work in an arid climate may be again recalled; for just as the wearing down of a mountain in a temperate region diminishes the snowfall upon it, so when a mountain range in a desert lowland is worn down the rainfall upon its area will decrease, and eventually, when the range is reduced to low relief, its surface will be about as dry as the lowland around it and subject to further degradation rather by wind than by water action. It was, I believe, Tyndall who first fancifully suggested that deglaciation might be the result of loss of height by

FIG. 19 –Glaciers on Mission Range, southeast of Mt. McDonald. (Photo by C. D. Walcott.)

glacial erosion;[10] it is now generally agreed that deglaciation was the result of climatic change. Thus two schemes of the life history of a glacier are suggested: one is the highly ideal scheme of a constant climate, during which an upraised mountain mass will, if at first high enough, be glaciated until it is worn so low that its snowfall is lessened and its glaciers disappear, as Tyndall imagined for the actual case of the Alps, and as is above outlined for a supposititious case; this involves a complete "cycle of glacial erosion",[11] in the same sense that the wearing down of an upraised mass by weather and water involves a complete cycle of normal erosion. The other scheme is the more expectable one of a variable climate, in which a mountain mass will be glaciated only as long as the snowfall is sufficient to form glaciers, as was the case with Pleistocene glaciation; glaciers were then extinguished long before their work was completed, and hence, thus limited, the "life history of a glacier" as presented by Russell[12] and the "cycle of mountain glaciation" as presented by Hobbs[13] include only a life history or cycle cut short by climatic change in its prime; that is, a mere episode of glaciation, in which only the earlier stages of a complete cycle, the earlier phases of a full life history are considered. In the Mission Range we evidently have to do only with an episode of glaciation due to climatic changes, introduced upon a mountain already well carved by normal erosion from its initial form; an episode that was closed long before the final stage of an uninterrupted cycle of glacial erosion was reached.

The Explanatory Description of Mountains. The Mission Range forms an admirable subject for close examination by a student of physical geography to whom camping and climbing are exhilarating and to whom the study of land forms is a specialty; all the better if he could go on from the forms to their climate and their inhabitants, and thus make himself a full-fledged geographer. The district is easily accessible; supply stations are abundant near the mountain base. The range is sufficiently separated from its neighbors to form a well-limited field of work. Its rocks, as far as I have learned, have neither paleontological content nor petrographical composition in such variety as to distract a would-be geographer into irrelevant geological complications. The varied physiographic features are developed with remarkable clearness; if accurately described and illustrated they might serve as standards, in terms of which other less simple ranges could be advantageously treated.

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10 Tyndall wrote: "Given the uplifted land, and we have a glacial epoch; let the ice work down the earth, every foot it sinks necessitates its own diminution; the glaciers shrink as the valleys deepen; and finally we have a state of things in which the ice has dwindled to limits which barely serve as a key to the stupendous operations of a by-gone glacial age. To account for a glacial epoch, then, we need not resort to the hard hypothesis of a change in the amount of solar emission, or of a change in the temperature of space traversed by our system. Elevations of the land, which would naturally accompany the cooling of the earth, are quite competent to account for such an epoch; and the ice itself, in the absence of any other agency, would be competent to destroy the conditions which gave it birth." (The Conformation of the Alps, *Philos. Mag.*, Vol. 24, 1862, pp. 169-173; see pp. 172-173.)

11 See reference in footnote 3, p. 294.

12 I. C. Russell: Glaciers of North America, Ginn, Boston, 1897, Chapter 10.

13 W. H. Hobbs: The Cycle of Mountain Glaciation, *Geogr. Journ.*, Vol. 35, 1910, pp. 146-163 and 268-284.

FIG 20—Mission Range in vicinity of Mt. McDonald, from head of Swan River. (Photo by C. D. Walcott.)

FIG. 21—Mission Range in vicinity of Mt. McDonald, from ridge on north head of Swan River. Alt. 6,900 ft. (Photo by C. D. Walcott.)

A spirit of geographical adventure has encouraged me here to set forth the results of a mere reconnaissance; first, because so little is known geographically of the individual ranges of Montana that every contribution to their further description is desirable; again, because the appearance of an incomplete account of the Mission Range may hasten the production of a more thorough study; finally and chiefly, because incomplete as this account is, it has a value in showing that a systematic method of treating land forms is sometimes applicable in rapid work, where conservative geographers of the empirical school think it is inapplicable, their idea being that explanatory description must demand long and intensive study, and therefore cannot be based on brief inspection.

STUDIES IN ECONOMIC GEOGRAPHY*

By CHARLES REDWAY DRYER

(I) Definitions and Classifications

INTRODUCTION; BASIC DEFINITIONS

In economic geography, lack of organization is at once a reproach and a handicap to the geographer. To remove both in some degree, especially the handicap, I have been led to devise and use a scheme of definitions and classifications, which is offered as tentative and at least workable. It is based upon the following thesis proposed by J. Russell Smith and restated by W. S. Tower:

"Economic geography is the description and interpretation of lands in terms of their usefulness to humanity. Its net result is the understanding of the relationship between the people of a district and their physical environment."[1]

"Economic geography is the study of the different types of environments in the relations they bear to the activities of human life."[2]

These definitions do not err upon the side of being too narrow and are open to the objection of including the whole of anthropogeography. They are unquestionably geographical and stress a relationship between a physical complex and a human complex. The physical complex is called an environment, and convenience calls for an equally simple term to designate the human complex. For that purpose I use the word *economy,* which I define as a way or method by which living creatures, especially men, get or may get a living. Conversely, an *environment* is that part of the face of the earth with which living creatures, especially men, taken singly or in groups, are closely related in the process of getting a living. Using these terms to express the idea of Smith and Tower, *economic geography* is that part of anthropogeography which studies the relationships between environments and economies and deals with natural resources, industries, and the distribution of useful products.

Industrial geography is that part of economic geography which deals with the work by which useful products are obtained and manufactured.

Commercial geography is that part of economic geography which deals with the exchange of goods.

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* Read at the twelfth annual meeting of the Association of American Geographers, Washington, D. C., December 30-31, 1915, and January 1, 1916.

[1] J. Russell Smith: Economic Geography and Its Relation to Economic Theory and Higher Education, *Bull. Amer. Geogr. Soc.*, Vol. 39, 1907, pp. 472-481; reference on p. 475.

[2] W. S. Tower: Scientific Geography: The Relation of Its Content to Its Subdivisions, *Bull. Amer. Geogr. Soc.*, Vol. 42, 1910, pp. 801-825; reference on p. 818.

The large factors to be dealt with in economic geography fall into two categories, environments, which are fundamentally physical, and economies, which are largely psychical, and each demands rational classification.

CLASSIFICATION OF ENVIRONMENTS

The character of an environment is determined by a complex of pedographic,[3] hydrographic, climatic, phytographic, and zoögraphic conditions combined in vast variety. As I have argued at length elsewhere,[4] the general resultant of environmental conditions is best expressed in terms of phytography, because the vegetation of a region is an index (1) of its relief, soil, and climate, and (2) of its fitness to support animal and human life. Therefore environments may be broadly classified according to vegetation and subdivided according to other conditions which impose upon them locally a special character. This is shown in Table I.

TABLE I—CLASSIFICATION OF ENVIRONMENTS

	TYPICAL ECONOMIES (Notation of Table II)		TYPICAL ECONOMIES (Notation of Table II)
A GENERAL CONDITIONS		B SPECIAL CONDITIONS	
I Phytographic		II Morphologic	
a Woodland		13 Mountains	4, 5, 6, V
		14 Plains	B, C, D
1 Tropical Rain Forest	1, 2, 3, 4		
2 Monsoon Forest	1, 2, 3, 4, 7	III Regolithic*	
3 Temperate Rain Forest	9, 10, 11, 12	15 Alluvial	III, IV
4 Temperate Summer Forest	13, 14, 15	16 Glacial	
5 Coniferous Forest	2, 3, 4, 12		
6 Tropical Dry Forest	7, 8, 9	IV Marine	
	11, 14	17 Interior	
b Grassland		18 Coastal	D
7 Savanna	3, 7, 14	19 Peninsular	
8 Prairie	9, 14, 15		
9 Steppe	14	V Mineral	
10 Tundra	3, 14	21 Coal	
		22 Iron	5, 6, C
c Desert		23 Gold	
11 Warm Desert	7, 14	etc.	
12 Cold Desert	2, 3		

* ῥῆγος, a rug, a blanket: i.e. "blanket-rock" (F. J. H. Merrill).

CLASSIFICATION OF ECONOMIES

A classification of economies, based in part upon Friedrich's "Wirtschaftsgeographie"[5] is shown in Table II. The letters and numbers of the tables furnish a notation by which they can be correlated.

[3] πέδον, the ground, the soil.

[4] Regional Geography, *Journ. of Geogr.*, Vol. 11, 1912-13, pp. 73-75, reference on p. 74; The New Departure in Geography, *ibid.*, Vol. 11, 1912-13, pp. 145-151 and 177-180, reference on p. 178.

[5] Ernst Friedrich: Allgemeine und spezielle Wirtschaftsgeographie, 2nd edit., Göschen, Leipzig, 1907.

TABLE II—CLASSIFICATION OF ECONOMIES

	TYPICAL ENVIRONMENTS (Notation of Table I)
A COLLECTIVE	
I Primitive	
1 Plucking	1, 2
2 Fishing	1, 2, 5, 12, 18, 19, 20,
3 Hunting	3, 4, 5, 7, 8, 12, 13
II Scientific	
4 Lumbering	3, 4, 5
5 Mining	13, 21, 22
6 Quarrying	......
B PRODUCTIVE	
III Agriculture	
7 Hoe Culture	1, 2, 7, 11
8 Garden Culture	2, 6, 15
9 Field Culture	3, 4, 8, 14, 15, 16
10 Plantation Culture	2, 3, 7
11 Horticulture	......
12 Forestry	4, 5
13 Plant Breeding	......
IV Animal Industry	
14 Herding	9, 10, 11
15 Stock breeding	......

	TYPICAL ENVIRONMENTS (Notation of Table I)
C CONSTRUCTIVE	
V Manufacturing	13, 21, 22
VI Building	......
VII Engineering	......
16 Mechanical	......
17 Chemical	......
18 Architectural	......
19 Hydraulic	......
20 Naval	......
21 Mining	......
22 Military	......
23 Civil	......
24 Sanitary	......
D DISTRIBUTIVE	14, 18, 19, 20
VIII Commerce	......
IX Finance	......
X Transportation	......
XI Communication	......
E PERSONAL	
XII Domestic Service	......
XIII Professional Service	......
25 Medical	......
26 Legal	......
27 Political	......
28 Educational	......
29 Literary	......
30 Artistic	......
31 Religious	......
32 Military	......

CLASSIFICATION OF ECONOMIC SOCIETIES

It is desirable to take account not only of environments and economies but also of their grand product and resultant, economic societies. They may be graded like organisms, according to their complexity and efficiency in the utilization of the environment. The following scheme is substantially that of Herbertson,[6] in which, however, I have made some important modifications. See Table III.

TABLE III—CLASSIFICATION OF ECONOMIC SOCIETIES

A SIMPLE, OR AUTARKEAN,* SOCIETIES (independent, self-supporting, nomadic, sparse)	B COMPLEX, OR ALLELARKEAN,† SOCIETIES (interdependent, fixed, dense, civilized)
1 Collective	4 Productive
2 Hoe Cultural	5 Productive and Distributive
3 Pastoral	6 Constructive and Distributive
	7 Productive, Constructive, and Distributive (potentially self-supporting, practically dependent)

* *χώρα αὐταρκής*, a country that supplies itself (Thucydides).
† *ἀλλήλων ἀρκεω*, of use to one another.

(A) *Simple Societies* depend upon the resources of their immediate environment, which are either meager or imperfectly utilized. Their wants

[6] A. J. Herbertson: A Handbook of Geography, 2 vols., Nelson, London, 1911-12; reference in Vol. 1, pp. 123-129.

are few and their industries rudimentary. Foreign trade is insignificant. They are independent, self-supporting, and usually nomadic. The density of population rarely rises to one to the square mile.

There are three types of prevailing economy:

(1) *Collective.* These are societies which by plucking, fishing, and hunting use and destroy natural resources, producing nothing. They inhabit the extremes of the world, cold deserts, tundras, coniferous forests, tropical forests, and coastal and insular environments in all zones.

(2) *Hoe Cultural.* These are societies which combine hoe culture with collective economy and herding. They occupy savannas, tropical islands, and the margins of warm deserts and forests. Their population is more dense than that of other simple societies.

(3) *Pastoral.* These are societies whose main resource is grass and domestic animals. They inhabit steppes, savannas, and tundras.

(B) *Complex Societies* depend upon other societies to supply a large part of their wants, which are numerous and varied. Foreign commerce is essential. The resources of their own environment are exploited and sometimes fully utilized, and industries are moderately to highly developed. They are interdependent upon one another. While their homes are fixed, they are individually the most nomadic of peoples. They flourish in the temperate forests and grasslands but are extending their economies and crowding on and out all simpler societies. There are four types:

(4) *Productive.* These are societies which produce foodstuffs and raw materials at home and obtain limited manufactures by trade. Their density may be very high. The best examples are to be found in China and India.

(5) *Productive and Distributive.* These are societies which export a large part of their foodstuffs and raw materials and import corresponding values of manufactured goods. When agricultural, they have a large excess of rural over urban population. They are young and sparsely populated countries, in many cases colonial. Australia, South Africa, and Argentina are examples. They are complementary to and dependent upon those of the next type.

(6) *Constructive and Distributive.* These are societies which import most of their foodstuffs and raw materials and export manufactures. They live chiefly on coal and iron and are very wealthy, but their resources are exhaustible. A coastal or insular environment is essential. The density of population is high with a large excess of urban. Great Britain and Belgium are the leading examples.

(7) *Productive, Constructive, and Distributive.* These are societies which export and import foodstuffs, raw materials, and manufactures. They practice all economies and exploit all kinds of resources. Commerce is extensive and varied. Rural and urban populations are nearly balanced. They might be self-supporting but actually enjoy all the resources and products of the world. Their wealth is capable of indefinite increase.

These, the most complex of societies, are possible only in highly complex environments. Of such the United States is, far and away, the best example. The only environment comparable with the American is the Russian, but many of its economies are undeveloped. On a small scale, France and Germany belong to the same class. To the latter must be awarded the palm for thoroughness and completeness in the utilization of an environment in many respects inferior.

REFLECTIONS

Environments are as stable and enduring as other large features of nature; economies are subject to the vicissitudes of human history. Consequently they may be extinct, kinetic, or potential. The environment of Mesopotamia has remained essentially the same since Adam and Eve dwelt in the Garden of Eden. The intensive agriculture of the Chaldeans and Babylonians, almost extinct under the Turks, is still potential and may become again kinetic under British or German influence. The Chinese environment has changed only by the removal of forests, and Chinese economy has proved the most enduring now in existence. It would be difficult to show how the environments of North America have changed in any important particular in the last thousand years, but the collective economy of the Indian has been displaced by the highly complex economy of the Americans, which was potentially present in pre-Columbian times. The economies of half the world are still potential.

People are civilized in proportion as they adapt themselves to a large and varied environment and to the complexity of their economy.

(II) The Economic Regions of the United States

In extent and complexity the United States is comparable with the whole of Europe. To deal with it from the standpoint of economic geography it is necessary to divide it into economic regions, based on differences of natural environment. The imperative, primary division is into east and west; the one, low, smooth, humid, and Atlantic; the other, high, rough, arid, and Pacific. The dividing line is a delightfully critical one, where the isohypse of 2,000 feet and the isopleth of 20 inches nearly coincide with the median meridian of 100° W. The large physiographic and climatic features trend north and south and vary east and west. My scheme of subdivisions is shown on the map, Figure 1, where, for statistical and other obvious reasons, state boundaries are used. Each border state is included in the region where its principal economies place it, and the resulting discrepancies are not very serious.

THE MIDDLE WEST

The economic foundation, core, and center of gravity of the country is the Middle West. It has an almost ideal allotment of coniferous forest,

summer forest, and prairie, passing into steppe on the west. Two-thirds of it is a plain of glacial drift. There are no mountains, few hills, and dissected uplands occur only in the southeast and southwest. It is far inland, but the Laurentian lakes, with their connecting rivers and canals, give the region an almost coastal character. Coal, iron, and copper are abundant and conveniently located. The region is lacking in no prime resource except water power.

The economies of the Middle West are developed to an extent which makes it the granary, smoke-house, cellar, and pantry of the American homestead. Constructive economies are not far behind productive, and dis-

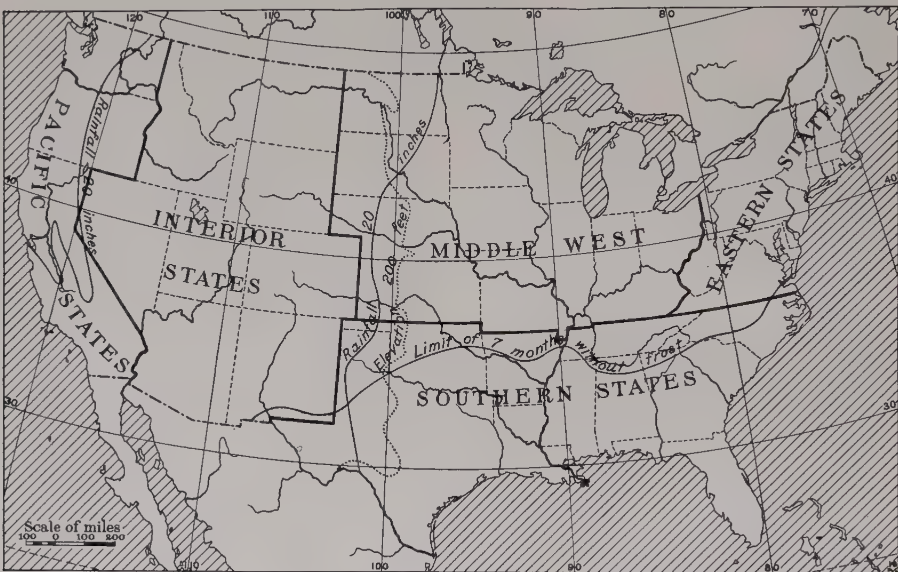

FIG. 1—Map of the economic regions of the United States as used in the present paper. Scale, 1:40,000,000. (*Note:* On the dotted line indicating elevation near the 100th meridian, for "200 feet" read 2,000 feet.)

tribution is as easy and active as is possible anywhere on land. The lines in which the Middle West takes a high rank are shown in Table IV, standing being expressed in percentages of the total for the United States.

To summarize the table, the Middle West has approximately one-fourth the area, one-third the population, one-half the improved land and two-fifths of the railroad mileage of the United States. It furnishes 70 per cent of the grain and meat, 60 per cent of the butter, cheese, and flour, 50 per cent of the potatoes, hay, tobacco, and domestic animals, 85 per cent of the iron ore, and 30 per cent of all minerals. It manufactures 70 per cent of the agricultural implements, vehicles, and distilled spirits, 50 per cent of clay products, 40 per cent of foundry products, cement, and soap, 35 per cent of iron and steel and printed matter, and 35 per cent of all manufactures. Its total wealth calculated in several different ways is about 40 per

TABLE IV—LEADING ECONOMIC FACTORS OF THE MIDDLE WEST

	YEAR	PERCENTAGE OF TOTAL FOR U.S.		YEAR	PERCENTAGE OF TOTAL FOR U.S.
Land area	....	27	Iron ore (tons)	1913	85
Population	1910	35	Zinc (tons)	1913	52
Improved land	1910	58	Clay products (value)	1913	49
Rural population	1910	57*	Cement (value)	1913	40
Corn (bushels)	1912	71	All minerals (value)	1913	29
Wheat (bushels)	1913	70	Agricultural implements (value)	1909	79
Oats (bushels)	1912	80	Meat (value)	1909	70
Barley (bushels)	1912	68	Automobiles (value)	1909	73
Rye (bushels)	1913	65	Carriages and wagons (value)	1909	63
Tobacco (pounds)	1912	52	Distilled spirits (gallons)	1913	69
Potatoes (bushels)	1912	50	Butter and cheese (value)	1909	63
Hay (tons)	1912	48	Flour (value)	1909	60
Swine (number)	1912	64	Fermented liquors (barrels)	1913	44
Horses (number)	1912	59	Pig iron (tons)	1913	39
Milch cows (number)	1912	51	Pig iron (value)	1909	34
Neat cattle (number)	1912	42	Steel (value)	1909	36
Animals sold and slaughtered (value)	1909	52	All manufactures (value)	1909	35
Fowls and eggs (value)	1909	54	Railroad mileage	1913	40
Dairy products (value)	1909	47	Natural wealth produced	1909–10	48
All animal products (value)	1909	60	Net wealth produced	1909–10	43
All crops (value)	1909	49	Total wealth	1912	39
All farm products (value)	1909	53			
Farm property (value)	1909	60			

* Per cent of region.

cent of the total of the United States and greater than that of any other region. Its environment is the best in America and one of the best in the world. Nowhere else are the productive, constructive, and distributive economies more happily combined. As an economic unit, it is an epitome of the whole country and a particularly young and vigorous specimen of the highest class of economic societies.

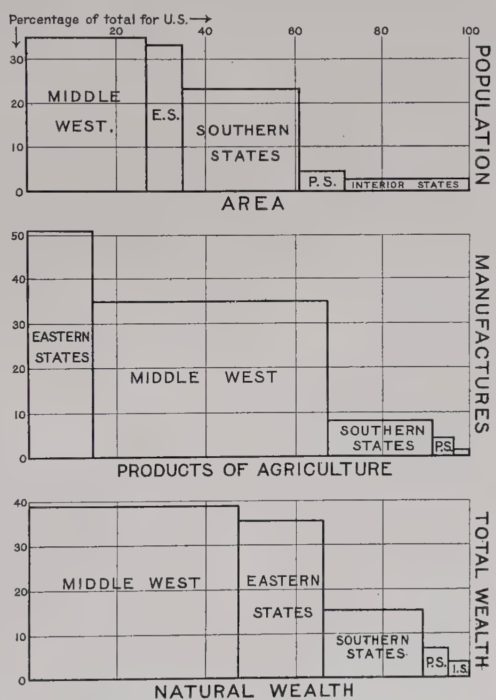

FIG. 2—Diagram showing the economic rank of the five economic regions of the United States.

THE EASTERN STATES

The Eastern States are characterized by generally rough relief, with a narrow coastal plain and narrower lake plain. The environment is mildly mountainous and strongly coastal. Its coniferous and summer forests have been important in the past. Rough relief, inferior soils, and lack of plains and prairies are handicaps to agriculture. Water power, vast stores of anthracite and bituminous coal, and the Atlantic coast line, with its numerous tidal inlets, are

controlling factors. The vital importance of the Laurentian gap, giving access to the food supplies and iron ore of the Middle West, can hardly be overestimated. While field culture, gardening, horticulture, and dairying are not negligible, the region is marked out by nature as the seat of manufacture and commerce. With a start of two centuries ahead of the rest of the country and with Europe close by to furnish an unlimited supply of cheap labor, the result is as natural as the march of the day from sunrise to noon. The economic rank of the Eastern States in their leading lines is shown in Table V.

Table V—Leading Economic Factors of the Eastern States

	Year	Percentage of total for U.S.		Year	Percentage of total for U.S.
Land area	....	8	Ship building (value)	1909	60
Population	1910	33	Paint and varnish (value)	1909	49
Urban population	1910	67*	Fermented liquors (gallons)	1914	48
Of foreign parentage	1910	53*	Printing and publishing (value)	1909	52
Employed in manufacture	1910	40*	Foundry & mach. shop products (val.)	1909	50
Silk (value)	1909	97	All manufactures (value)	1909	51
Woolen goods (value)	1909	95	Coal (value)	1913	60
Dyeing and finishing (value)	1909	92	Natural gas (value)	1913	66
Carpets and rugs (value)	1909	92	Stone (value)	1913	47
Hosiery and knit goods (value)	1909	78	Cement (value)	1913	40
Cordage and twine (value)	1909	74	All minerals (value)	1913	37
Clothing (value)	1909	72	Apples (bushels)	1914	49
Cotton goods (value)	1909	63	Dairy products (value)	1909	34
Boots and shoes (value)	1909	73	Orchard fruits (value)	1909	31
Leather (value)	1909	65	Potatoes (bushels)	1912	31
Gloves and mittens (value)	1909	62	Hay (tons)	1912	26
Paper and wood pulp (value)	1909	70	Tobacco (pounds)	1912	26
Electrical machinery (value)	1909	70	All farm products (value)	1909	15
Chemicals (value)	1909	69	Railroad mileage	1913	17
Glass (value)	1909	58	Foreign commerce	1913–14	64
Steel (value)	1909	60	Imports	1913–14	77
Pig iron (value)	1909	51	Total wealth	1912	35
Pig iron (tons)	1913	50			

* Per cent of region.

The Eastern States, with one-twelfth the area of the United States, have one-third the population, 67 per cent of which is urban and 53 per cent of foreign parentage. Their manufacture of textiles ranges from 63 per cent of cotton goods to 97 per cent of silk. They make 70 per cent of the leather, leather goods, and clothing, 60 per cent of steel and glass, 55 per cent of paper, chemicals, and electrical machinery, 50 per cent of pig iron, foundry products, soap, fermented liquors, paint and varnish, build 60 per cent of the ships, do more than half the printing and publishing, and turn out more than half the value of all manufactures. They mine 60 per cent of the coal, 66 per cent of the natural gas, and 38 per cent of all minerals. With 16 per cent of the railroad mileage, they have 64 per cent of the foreign commerce and 77 per cent of the imports.

They contain the leading seaport and the second largest city in the world, which has a real estate valuation greater than that of all the wealth of the western half of the United States. This accumulation may be regarded as profits derived from the elaboration and exchange of the

products of the Middle West. The total wealth of the Eastern States is about 35 per cent of that of the United States and is second only to that of the Middle West. They belong to the constructive and distributive class of economic societies, are already a formidable rival of Great Britain for first place in that class, and the end is not yet.

THE SOUTHERN STATES

The Southern States look on the map as if they had been shorn as mercilessly as some of the European countries will be at the close of the present war. But in economic geography, political and social prejudices do not count in the face of natural and economic conditions. Geographically, the Southern States are bounded on the north by the limit of seven months without frost and are distinguished as being the realm of King Cotton. More than half their area is coastal plain, occupied largely by an anomalous coniferous forest in the warm temperate zone, where, according to rule, a temperate rain and summer forest belongs. The Appalachian Highland thrusts its salutary bulk into the plain, and the wide, alluvial valley of the lower Mississippi cuts it in two. In the west the body of the giant among states extends well into the arid plateaus. The long coast line on the Atlantic and on the American Mediterranean has failed, largely on account of shallow coast waters, to produce an adequate response. In the days of slavery the economy of the Southern States was singularly simple, artless, successful, and, in the long run, suicidal. Cotton was grown on shifting plantations and exchanged in raw bulk for almost everything else. This one-crop agriculture persists and is still the bane of Southern economy. Citrus fruits, sugar cane, and rice flourish in strictly limited areas and introduce local variations of the one-crop system. The boll weevil and the European war may prove efficient blessings by breaking up the one-crop system and compelling the people to raise at least corn and cattle enough to feed themselves.

Manufacturing has grown to relatively large proportions but is still based on cotton. The water power of the Highland has been harnessed to a network of hydro-electric power transmission said to be the most extensive in the world. Iron and coal in Alabama and petroleum in Oklahoma, Texas, and Louisiana induce local eruptions of collective and constructive activity. The coniferous and hardwood forests of the South are proving a widow's cruse and saving the Middle West and the Eastern States from a timber famine.

After all this is said, it remains to say that the Southern States are the most strongly agricultural region in the country, with a rural population of 80 per cent, 60 per cent of employed persons on the land and only 2 per cent foreign born. What the Panama Canal will do to them may be only conjectured, but their opportunities for commerce are beyond calculation.

TABLE VI—LEADING ECONOMIC FACTORS OF THE SOUTHERN STATES

	YEAR	PERCENTAGE OF TOTAL FOR U.S.		YEAR	PERCENTAGE OF TOTAL FOR U.S.
Land area	....	26	All farm products (value)	1909	24
Population	1910	24	Fertilizers (value)	1909	48
Rural population	1910	81*	Cotton goods (value)	1909	35
White population	1910	66*	All manufactures (value)	1909	8
Foreign born	1910	2*	Petroleum (value)	1913	36
Employed on land	1910	59*	All minerals (value)	1913	10
Cotton (bales)	1911	99	Timber and lumber (feet)	1913	47
Rice (bushels)	1913	99	Railroad mileage	1913	27
Oranges (value)	1909	26	Foreign commerce	1913–14	27
Mules (number)	1909	65	Exports	1913–14	31
Neat cattle (number)	1909	30	Natural wealth produced	1909–10	23
Improved land	1910	24	Total wealth	1912	15

* Per cent of region.

The Southern States have approximately one-fourth the area and population of the United States. They raise practically all the cotton and rice and 65 per cent of the mules. Neat cattle, mostly in Texas, amount to 30 per cent, oranges to 26 per cent, corn and tobacco to 22 per cent, and all crops to 29 per cent. Their only notable manufactures are cotton goods, 35 per cent, and fertilizers, 48 per cent. They cut 47 per cent of the timber and lumber and have 27 per cent of the railway mileage. Their foreign commerce is 21 per cent, in exports 31 per cent. Their total wealth cannot be rated higher than 16 per cent and is the lowest per capita in the United States. The Southern States are on their way out of an extreme Australian type of economy toward the higher type which their environment favors.

The western half of the United States seems to have been thrown in for good measure, heaped up, pressed down and running over. The best statistics now available give it a present value of about 10 per cent. Let us not hint that it is superfluous, but the question, What difference would it make if the Pacific Coast were east of the Rocky Mountains? might afford entertainment for the idle hour of a speculative geographer.

THE INTERIOR STATES

The Interior States are occupied by high, arid plateaus, and saved from desert conditions by a broad central backbone of lofty mountains, which act as a condenser and furnish water and impetus for streams which overcome all obstacles on their way to the Gulf and the Pacific. They almost touch the sea on the southwest, but have no ports or navigable rivers, except the Columbia. The mountain barrier on the west cuts them off from the softening and enriching influences of the Pacific, and the environment is one of mountains, steppe, and desert, which shade into one another with every degree of blending.

While the area is 29 per cent, the population is less than 3 per cent, with a density of three to the square mile. The 64 per cent of urban population

TABLE VII—LEADING ECONOMIC FACTORS OF THE INTERIOR STATES AND THE PACIFIC STATES

Interior States	Year	Percentage of total for U.S.	Pacific States	Year	Percentage of total for U.S.
Land area	....	29	Land area	....	10
Population	1910	3	Population	1910	5
Urban population	1910	64*	Urban population	1910	57*
Silver (value)	1913	95	Foreign born	1910	23*
Copper (pounds)	1913	81	Oranges (value)	1909	74
Gold (value)	1913	69	Grapes (value)	1909	51
Lead (tons)	1913	62	Timber and lumber (feet)	1913	21
All minerals (value)	1913	16	Petroleum (barrels)	1913	39
Sheep (number)	1913	44	Petroleum (value)	1913	19
Wool (value)	1909	45	Gold (value)	1913	30
Neat cattle (number)	1913	14	Canning and preserving	1909	29
Railroad mileage	1913	10	Railroad mileage	1913	6
Total wealth	1912	4	Foreign commerce	1913–14	6
			Total wealth	1912	7

* Per cent of region.

does not mean large cities, but is an index of general sparseness. Crops and manufactures are relatively negligible. While herding is the most general economy, cattle amount to only 15 per cent. The only large figures are 44 per cent for sheep and 45 per cent for wool. Nearly 10 per cent of the employed are miners. The region produces 95 per cent of the silver, 81 per cent of the copper, 69 per cent of the gold, 62 per cent of the lead and 38 per cent of the zinc, but the total minerals amount to only 16 per cent. The steppe is being invaded by dry farming and the desert by irrigation. The total wealth is about 3.5 per cent, but is higher per capita than in the Middle West. Among invaluable riches not subject to appraisal are sanitary air, scenery, geological sections and fossils.

The Interior States are in an unstable and transitional stage of economic development. The value of crops now exceeds that of cattle and sheep. Water power is the only resource which can ever lift them out of a low rank among complex economic societies and make them more than tributary and supplemental to their richer neighbors. Perhaps they are worth the space they occupy as the home of the traditional Indian and cowboy, as a tuberculosis hospital, and as a field for desert botanical laboratories, university scientific excursions, and the promotion of railway engineering.

THE PACIFIC STATES

The Pacific States are a land of contrasts, where the highest and the lowest, the driest and the wettest, the hottest and the most temperate, bare desert and impenetrable forest occur in proximity. The sea, desert, palm groves, mountains, fir forests, and summer snows are visible in the same landscape. The region is a narrow strip between the mountains and the sea, 1,200 miles long and 300 miles wide, in which all sorts of gradients are steeper crosswise than lengthwise. The phytographic environment

ranges from warm desert through tropical dry forest to coniferous forest. The large coastal factor is peculiar in being generally unavailable but possessing two of the most spacious harbors in the world and a great river mouth.

In grain crops and domestic animals their rank is low, but in semi-tropical fruits high, ranging from 51 per cent of grapes to 74 per cent of oranges and a monopoly of olives and figs. The leading minerals are petroleum, 40 per cent in quantity although but half that in value, and gold, 30 per cent. The only notable line of manufacture is canning and preserving, amounting to 30 per cent. The 20 per cent of timber and lumber now cut is but a sliver from the richest coniferous forest in the world. If the petroleum holds out, it will make up largely for the lack of coal, and, if it gives out, the mountain streams can furnish hydro-electric power sufficient for a dense manufacturing population. From the economic standpoint cheap labor is the one thing most needed. It knocks at the doors and almost batters them down but is denied admission. The most enduring natural assets of the Pacific States seem to lie in their unrivaled forests, Mediterranean climate, and the Pacific Ocean. Their foreign commerce is now 6 per cent, or a little less than that of the Middle West. The total wealth, about 7 per cent, is the highest per capita in the United States.

As an economic unit the region is difficult to classify, but seems to be a youthful and precocious specimen of the highest type, in which productive, constructive, and distributive economies will at maturity be highly developed. It is a rough and narrow strip with small hinterland, separated by a thousand miles of mountains and desert from the rich communities of the East, to which it is artificially tied. But it faces and must control the commerce of the Pacific, which is said to be the ocean of the future. If a recent economist[7] is right, the Panama Canal and petroleum fuel will make freight and passenger rates as low between San Francisco and Liverpool as between New York and Liverpool, the treasures of the Atlantic will be open, and the Pacific Coast will experience such a boom in immigration and commerce as the world has never seen. It is the big youngster of Uncle Sam's family, who is rapidly outgrowing the awkwardness and bluster of adolescence and promises to attain imposing proportions and dignity. Nevertheless, if I may claim the right of a mere geographer to indulge in scientific prophecy, I see no reason to withdraw the forecast, made on a previous occasion,[8] that "if there are ever as many people and as much wealth between Los Angeles and Prince Rupert as between Chesapeake Bay and the Gulf of St. Lawrence, it will be when San Francisco is the capital of Japanese or Chinese America."

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[7] R. L. Dunn, *Senate Doc. No. 540, 63d Congr., 2nd Session.*

[8] The North America of Today and Tomorrow and Indiana's Place in It, *Proc. Indiana Acad. of Science,* 1911, pp. 37-54; reference on p. 51.

GEOGRAPHICAL RECORD

AMERICAN GEOGRAPHICAL SOCIETY

Additions to the Society's Map Collection. A large number of British Admiralty charts were recently added to the map collection. They were selected in such a manner that with their acquisition all of the charted coasts of the world are now represented in the Society's series. It is proposed to increase this collection from time to time by adding the largest-scale charts of important regions. This will be done, in part, by means of U. S. Hydrographic Office charts, all the recently issued sheets of which have been purchased. Furthermore, the entire set of charts issued by this office for South American waters was recently purchased.

Pursuing its policy of maintaining an unbroken chronological sequence in the maps of a given region, the Society has lately added a number of photostatic copies of notable American maps to its collection. These reproductions have the same size as the originals and are quite convenient for working purposes. Among them are:

Augustin Hermann's Map of Virginia and Maryland, 1673
Captain John Smith's Map of Virginia and Maryland, 1608
Filson's Map of Kentucky, 1784
Bernard Roman's Map of Florida, 1774
John Fitch's Map of the Northwest, 1785
Thomas Pound's Map of New England, 1691
John With's Map of Virginia, 1585
The Vingboom Map of New York, 1639
The Des Barres Map of Penobscot Bay, 1776.

NORTH AMERICA

Further News of the Explorer Radford's Death. The death of Harry V. Radford, the explorer, at the hands of Eskimos on or about June 5, 1912, at Bathurst Inlet on the Arctic coast of Canada was noted in the *Bulletin of the American Geographical Society* for December, 1913 (pp. 924-925). This information was based on Eskimo reports to the Royal North West Mounted Police. As a consequence a party of five mounted policemen was sent out two years ago to apprehend the slayers. News has recently been received from Mr. John I. Inglis of Ottawa that the culpable Eskimos have not yet been found; the police, however, obtained important information which promises an early successful termination of the search. The first party is being relieved by a second party of mounted police which sailed from Montreal on August 9 for Hudson Bay. The most reliable information with regard to Radford's death was contained in a report from H. H. Hall, manager of the Hudson Bay Company's trading post at Chesterfield Inlet on the northwestern shore of the bay, a copy of which was sent to the Society and portions of which were published in the newspapers at the time Radford's will was probated in New York City, October 5, 1915. According to this report, the murder occurred just as the explorer was setting out on a sledge journey. One of the two local Eskimos who had been engaged for the journey had already started when the other refused to go. To enforce obedience, Radford struck him with the handle of a whip; a fight ensued and Radford was speared in the back by another native. T. George Street, Radford's white companion, made a run for the sledge to get a gun but was killed before he could reach it. From the story told Mr. Hall by his informant, a civilized Eskimo who had met members of the Bathurst Inlet tribe a few days later, it seems that the man refused to go because his wife had become suddenly ill. Radford was not familiar with the language of this tribe and must have misunderstood the man's meaning. Blows once dealt, the rest followed quickly, as, in their primitive state, these Eskimos generally settle quarrels and disputes with the death of one of the combatants.

References to the primitive state of this tribe are contained in a letter from Radford to this Society, dated June 5, 1912, the probable date of his death, in which he said: "We found a very primitive tribe of Eskimos inhabiting Bathurst Inlet, who have no intercourse with whites. They possess no rifles, and hunt, as of old, with the bow, spear, and harpoon; use stone kettles and knives of hammered native copper; and strike fire with stones and tinder, or by rubbing a pointed stick into another piece of wood until the latter becomes heated enough to ignite. They speak a dialect very

different from that of the inland Eskimos and those who dwell near Hudson Bay; and Mr. Street and I find it difficult to communicate with them.''

Radford was thirty-one years old at the time of his death. He became a Life Fellow of this Society in 1908. In 1909 he set out upon the expedition on which he was engaged when he was killed. His main work was zoölogical, but he made it a point to maintain track surveys of his route, an undertaking in which his training as a civil engineer gave him proficiency. In this way he was able, in no inconsiderable degree, to rectify the maps of the regions he had traversed. His route lay from Lake Athabaska, down the Slave River to Great Slave Lake; thence northeast and eastward via Artillery Lake, the lower Thelon River, and Schultz and Baker Lakes to Chesterfield Inlet on Hudson Bay. From that place he traveled back, retracing his steps for part of the journey and then striking northwest until he reached Bathurst Inlet on the Arctic coast of Canada. There, shortly before his death, he surveyed the western coast of the inlet as far north as 67° 15′ N.; and it was his wish to complete the survey of this, ''the last strip remaining unexplored of the continental coast of North America,'' as he himself expressed it. The completion of this gap, left open by the Franklin expedition in 1821, by the southern party of the Stefansson expedition was recently reported (see the September *Review*, p. 232). From Bathurst Inlet Radford had planned to continue west along the coast to the mouth of the Mackenzie and thence to Fort McPherson and Dawson, hoping to reach New York early in 1913.

A progressive account of his expedition, as reported in his letters to the Society, will be found in the *Bulletin of the American Geographical Society,* as follows: 1909, p. 624; 1911, pp. 134 and 777; 1912, pp. 46-47 and 600-601; 1913, pp. 134 and 924-925.

Exploration of the Region between Athabaska and Great Slave Lakes. In approximate figures 850,000 square miles or one-quarter of the total area of continental Canada is unexplored country. One of the largest of the unexplored ''blocks'' was the eastern portion of the territory between Lakes Athabaska and Great Slave. The Canadian Geological Survey now publishes the report of a reconnaissance made across it in 1914 (Charles Camsell: An Exploration of the Tazin and Taltson Rivers, North West Territories, *Geol. Survey of Canada Memoir 84,* Ottawa, 1916). Heretofore the only written record of the region was that by Samuel Hearne, who passed through in 1772 on his return journey from the successful trip to the Coppermine River. A new edition of his account, ''A Journey from Prince of Wales Fort in Hudson's Bay to the Northern Ocean,'' was published in 1911 by the Champlain Society. Hearne's map and description have served practically all Canadian map makers until very recently. The newest maps, however, contain modifications and additions based on information from H. V. Radford, the explorer lately killed by Eskimos at Bathurst Inlet, to whom reference is made in the preceding item. It is not known whether he gained his material by personal experience or through Indian informants. King, who accompanied Back in his explorations of the early thirties, published an Indian route map and description followed in part by the Survey expedition.

The region, comprised largely by the basin of the Taltson River, is typical Laurentian Plateau country. Travel in summer is possible only by canoe. During the journey down the Taltson and Tazin Rivers the Survey party had to make forty portages and run ''dozens of rapids.'' Bare rock surface exhibiting signs of intense glaciation is everywhere the characteristic feature. The only considerable area of sedimentary material is found towards the mouth of the Taltson River, which there cuts through an ancient delta of the Slave River. On the west the region borders the great highway to the Mackenzie, but its lack of natural resources have closed it to interest in the past and will probably continue to do so in the future. Timber is small and stunted; agriculture is precluded by the absence of soil; and, though the waters abound in fish, game is scarce save during the southward migration of the caribou. The mineral possibilities are unknown. The small Indian population belongs to two tribes of Athabaskan linguistic stock, the Caribou Eaters branch of the Chipewyans, and the Dogribs. The latter appear to have absorbed or dispossessed the former inhabitants, the Yellow Knives, or Copper Indians. The movements of this nomadic population embrace a summer visit to one or another of the trading posts, Fort Smith, Fond du Lac, Chipewyan, or Resolution for the receipt of the annual government grant; an autumn gathering about the headwaters of the Taltson to hunt the southward-migrating caribou on the southwestern fringe of the Barren Grounds; and a winter return to the trading posts at Christmas and Easter to take part in the religious festivals, for all the natives now belong to the Roman Catholic church.

Forest Fires and Conservation in the Ontario Clay Belt. In northern Ontario is a belt of country underlain by clay and marked by excessive moisture and a short growing season. The settlers have tried to reduce the moisture and lengthen the growing

season, at the same time that they cleared the land for agriculture, by burning the forest, especially along the line of the Temiskaming and Northern Ontario Railway. To this action the Canadian Forestry Association and others make protest. The fires spread to the "absolute" forest land, useless except for growing trees, and almost irreclaimable for forestry once the humus has been burnt out of the thin soil. The settler contends that the clay belt, one of the few extensive tracks of potentially arable soil in northern Ontario, should be cleared as soon as possible and at minimum cost for immediate crop purposes. Thus the lumberman and the farmer in this frontier region have conflicting interests strongly reminiscent of the differences in our own West between cattlemen and sheep herders. Investigation is under way, and the case of the clay belt soils and forests in relation to agriculture promises to have scientific treatment (Burning Off the Claybelt, *Canadian Forestry Journ.*, April, 1916, pp. 468-470. For a reference to the location and character of the clay belt see R. W. Brock: The Physical Basis of Canada, pp. 9-91 [ref. on p. 64] in Vol. 9 of "Canada and Its Provinces" edited by Adam Shortt and A. G. Doughty, Toronto, 1914.)

The Florida State Census and 1916 Map. Beginning in 1885 the state of Florida, like a few others, has taken a census every ten years, midway between the federal censuses. The report for 1885 is said to have been a very small affair, perhaps a single sheet, giving only the total population by counties. That for 1895 is a pamphlet of about fifty octavo pages. The third census, taken in 1905, covered population, agriculture, and manufactures, and its report, published jointly by the Secretary of State and the Commissioner of Agriculture, comprises 304 pages.

The report for 1915 was published about the middle of 1916, by the Commissioner of Agriculture, as an octavo pamphlet of 78 closely printed pages. It covers population only, crop statistics being given in recent years in the biennial reports of the agricultural department. It begins with a four-page sketch of the history of Florida and a condensed summary of changes in county boundaries from 1821 to date. The tables include population by counties at each census from 1830 to 1915; the same grouped by five more or less arbitrary divisions, with calculations of the percentage of whites, density of population, and rate of increase between censuses, for each division (this table mostly prepared by the undersigned while in Tallahassee last fall); population of counties by race, sex, and age, illiteracy, nativity, etc.; population of minor civil divisions by race and age groups; deaf, dumb, and blind persons and centenarians, by counties; and population of cities and towns, by race, with comparisons with two earlier censuses. The areas given for the counties correspond with those in the government census of 1900, except where there have been subsequent changes, and they are remarkably inaccurate in some cases.

The schedules used in 1915 called for no specific information about marital condition, and consequently no statistics on that point are given. Some of the data gathered were not utilized, perhaps for lack of funds, namely, the number of families, the months of birth, and the state or country in which each person and his parents were born, except that the native and foreign-born population are separated in two of the tables. (The government census of 1880 gave the population of each county in the United States by state and country of birth, but since then this interesting information does not seem to have been given for areas smaller than states.) The population of minor civil divisions, including towns and cities, is not classified by sex, and thus the opportunity to analyze the effects of the migration of young men from old to new communities and check up some of the surprising figures in the government census of 1910 was lost.

It appears from the table showing the population of the state at different censuses (after correcting a few typographical errors) that the average quinquennial increase from 1880 to 1885, 1890 to 1895, etc., has been a little greater than that from 1885 to 1890, etc., which may indicate that the state censuses are the more complete, although the last one was taken in midsummer, when thousands of Floridians were away from home, while the last government census was taken in spring. The population on July 1, 1915, excluding inmates of the State Insane Asylum, was 921,618, an increase of 22.5 per cent in five years or 49.9 per cent in ten years, which is doubtless a more rapid increase than in any other eastern state during the same periods. The percentage of whites, 60.7, is higher than that in each of the five states from South Carolina to Louisiana inclusive.

This last report, unlike the preceding one, contains no map, but the lack is partly supplied by a fine large state map, 1:633,600, distributed gratuitously by the agricultural department about the same time. This map (which is revised every few years) does not show any subdivisions of counties, however, other than townships and sections, so that the statistics of population for minor civil divisions in the census report are of little value for geographical purposes.

ROLAND M. HARPER.

Committee to Expedite the Completion of the Topographic Map of the United States. At the third joint meeting of the Association of American Geographers and the American Geographical Society in New York on April 14 and 15, Professor W. M. Davis spoke informally on the desirability of accelerating the production of the topographic map of the United States (see the May *Review*, Vol. 1, p. 367). Since then a committee, organized by its chairman to promote this object, has sent out a circular letter to some two thousand addresses in all parts of the country. The committee consists of the following members: W. M. Davis, chairman, emeritus professor of geology, Harvard University, Cambridge, Mass.; A. E. Burton, secretary, dean, Massachusetts Institute of Technology, Cambridge, Mass.; Robert Bacon, president, National Security League, New York; Arthur H. Blanchard, consulting engineer, National Highways Association, professor of highway engineering, Columbia University, New York; G. P. Coleman, State Commissioner of Highways, Richmond, Va.; G. E. Condra, president, National Conservation Congress, State University, Lincoln, Nebr.; W. L. Darling, chief engineer, Northern Pacific Railway Co., St. Paul, Minn.; R. E. Dodge, president, National Council of Geography Teachers, Washington, Conn.; A. B. Fletcher, State Highway Engineer, Sacramento, Cal.; W. Cameron Forbes, of J. M. Forbes and Co., Boston, Mass.; John R. Freeman, consulting engineer, Providence, R. I.; W. O. Hotchkiss, State Geologist, Madison, Wis.; F. H. Newell, professor of civil engineering, University of Illinois, Urbana, Ill.; Joseph H. Pratt, State Geologist, Chapel Hill, N. C.; Wm. Barclay Parsons, consulting engineer, New York; Charles A. Stone, of Stone and Webster, Boston, Mass., president International Corporation, New York; Frank M. Williams, State Engineer, Albany, N. Y. The committee recognizes the excellent work of the U. S. Geological Survey, which has been carrying on the topographic survey of the United States for the last 35 years, and its appeal implies no criticism of this able organization. The outstanding fact is, however, that at the present rate of progress, in spite of liberal appropriations from Congress and generous co-operation from a number of states (see table), it would take about one

Cost and Rate of Progress of the Topographic Mapping of the United States

Year ending July 1	Appropriations		Area in square miles		Percentage of U. S. completed
	By Congress	By States	Surveyed	Re-surveyed	
1906	$489,200	$102,600	36,608	4,195	33.0
1907	459,200	121,800	32,495	1,847	33.8
1908	409,200	103,850	25,658	6,979	34.7
1909	384,200	100,000	23,831	11,200	35.5
1910	434,200	185,879	32,808	3,731	36.6
1911	434,200	156,376	23,496	6,460	37.4
1912	434,200	177,853	28,417	5,274	38 3
1913	434,200	161,267	18,731	3,987	38.9
1914	434,200	179.048	19,150	4,290	39.6
1915	434,200	186,800	20,527	3,048	40.2

hundred years to complete the mapping of the country. The handicap to many phases of our national development that such a situation entails does not need to be impressed upon geographers; and it is hoped that the appreciation of the value of the topographic maps which already exists among army officers, engineers, foresters, educators, and others will spread to include all who can derive benefit from their use. Every one who is interested in furthering the aim of the committee is urged to write to the secretary, Professor A. E. Burton, and to specify as definitely as possible the practical advantage that would accrue to him from the more rapid progress of our national map.

SOUTH AMERICA

The Lumber Markets of South America. This topic is discussed by Roger E. Simmons, Special Agent of the Department of Commerce, in two recently published reports (*Bur. of Foreign and Domestic Comm., Special Agents Series Nos. 112 and 117*, Washington, 1916). Argentina, Uruguay, and Brazil, especially the two first-named countries, constitute a valuable market for the lumber of North America. Uruguay is practically forestless, and, although Argentina possesses valuable forestal resources in the northern provinces, it is unlikely that these can ever replace the imported product. Apart from the cost and waste entailed in lumbering operations in the Chaco forests, the lumber obtained is in general only fitted for special purposes. With the exception of the Spanish cedar no tree has the equivalent usefulness of the imported softwoods—yellow pine, spruce, and white pine. The most valuable native species is the *quebracho*,

known for its high percentage of tannin and exported for such in the form of logs and extract. Other woods, as logs and rough forest products, find their way to the markets of the La Plata region, where is concentrated industry and commerce in both domestic and foreign lumber. Prior to the war, increase in the latter trade had led to notable change in the manner of shipment, i. e. the substitution of steamers for sailing vessels, whereby the cargo could be doubled or trebled and time reduced by one-half or one-third. A survey of Argentine forestal resources would include the woodlands occurring along a 1,300-mile stretch in western Patagonia. These forests, characterized by various species of beech and occasional conifers and araucarias, appear as five- to ten-mile strips along the watercourses. At present, with the exception of the extreme south that finds an outlet in the Chilean port of Punta Arenas, lack of communications precludes any attempt at development.

The Brazilian lumber industry is dissimilar in many respects from that of the La Plata region. Importation is distributed over a much greater area along the 4,000 miles of coast, though Rio de Janeiro and Santos account for the major part of the import. As in the La Plata district the chief imported wood is the southern yellow pine, locally known as the ''pinho de Riga'' from its resemblance to the resinous Russian pine that it has long since replaced, but there is also a not inconsiderable market for Scotch fir and Norway spruce from the Baltic countries. Brazil, with vast wealth in native forests, suffers the same impediments to development that are encountered in the Chaco. An exception to this is found in the recent exploitation of the so-called Paraná pine (*Araucaria brasiliensis*), a substitute for the northern conifers. This branch of lumbering, that was rendered possible by the construction of the Paraná railroad, presents an aspect entirely different from that of the rest of the industry. The characteristics of the araucarian forest are more favorable for lumbering, the species occurs in large and pure stands, and exploitation has been largely conducted by North American lumbermen.

The distinguishing feature of the lumber trade of the Pacific coast countries is the supremacy of the North American product. Punta Arenas, indeed, is the only port where European lumber is in greater demand. According to the latest statistics (1914) North America furnished 99 per cent of the imported lumber of Chile and a percentage only slightly less for Peru, where 80 per cent of the lumber of commerce is ''piño de Oregon,'' Douglas fir. For both Chile and Peru the proportion between imported and domestic lumber also appears astonishingly high. This is particularly surprising with respect to the temperate forests of southern Chile, whose economic possibilities have long attracted attention (see, for example, ''Account of the useful trees and shrubs of Chile, drawn up for the Court of Spain in obedience to the Royal Edict of July 20th, 1789, and forwarded with samples of the woods, etc., 10th December, 1792,'' given as a translation in the appendix to ''Journal of a Residence in Chile,'' by Maria Graham, London, 1824). A careful examination of the resources of these forests seems to show that their intrinsic value has been overestimated. Little merchantable timber save wood for fuel is now obtained north of the old Indian frontier of the Bio-Bio. Much of the more accessible forest has already been cut for lumber or cleared for farming. The center of exploitation has moved 175 miles south during the last ten years; it is now located about Valdivia, where the best of the Chilean lumber is to be found. The Chilean beech forest does not, however, supply the best lumber of commerce. The *roble,* or so-called Chilean oak, the cheapest and most abundant native wood, shows two detrimental features common to other Chilean species: its weight impedes handling, and the difficulty in seasoning is troublesome in the rainy latitudes of southern Chile. The principal Chilean softwood is the peculiar and distinctive Chilean pine (*Araucaria imbricata*), a relative of the Brazilian species, the Paraná pine. Growing on the higher slopes of the Cordillera, it still plays an important part in the economy of the Indians of southern Chile. They make annual excursions to gather the seeds of the cone much as the seeds of piñon are gathered by the natives of the arid American West. From the lumbering point of view its chief value probably lies in its properties as a pulp wood.

With regard to the lumber trade Ecuador occupies a unique position among South American countries. No regular importation of foreign timber is made. The reason appears to lie in the heavy protection of the home industry, an attempt to revive its ancient importance, for in bygone days Guayaquil was famous along the whole coast as a shipbuilding center and an exporter of lumber.

On the northern coasts the situation is again different. Like other tropical countries Colombia and Venezuela possess forests extraordinarily rich in species but ill-favored for lumbering purposes by reason of the mixed and scattered nature of the stands, whence only a small percentage of the timber is merchantable. Venezuela, importing about 45 per cent of the lumber consumed, is a good market for the Southern yellow pine. In Colombia the demand for foreign woods is much less, but the trade is interesting

because of certain peculiar features. Prior to the war a considerable part of the trade was conducted through an intermediate market in Porto Rico where Southern yellow pine from the Gulf ports was exchanged for mahogany and Spanish cedar from the Colombian forests.

Bolivia and the Tin Industry. The canning industry of the United States consumes as much tinplate as is used for this purpose by the rest of the world combined. Most of the tin originates in the Straits Settlements, where the very high export duties on ore have necessitated exportation in the metallic form. Part is transmitted directly, part comes through Europe, chiefly through the United Kingdom. Yet in the western hemisphere is the world's greatest reserve of tin ores—the great deposits of the Eastern Cordillera of Bolivia. In 1912 Bolivia's tin ore shipment amounted to 38,614 tons and formed 66.8 per cent of the total value of exports. Of this quantity the United States took eight tons! In 1915 the estimated importation from Bolivia was still under one hundred tons.

Though known and used from time immemorial, Bolivian tin has only figured in the world's markets during the last twenty years. Prior to the last decade of the nineteenth century, Bolivia's vast mineral resources had but one expression—silver. Depreciation in the value of this metal and increasing industrial demand for tin are revolutionizing Bolivian mining. Abandoned silver mines have been reopened for tin, great dumps around the old shafts worked over and new mines sunk, and the prospects are encouraging. Oruro, in the geographical center of the tin belt, highly developed during the "silver" days and possessing superior means of communication, is also the economic center. North, near La Paz, and south, at Chorolque, are other important fields. Of individual mines the Monte Blanco of Inquisivi are among the most famous. Here one of the lodes, six to nine feet wide, outcrops for a thousand feet on the mountain side at an elevation of over 16,000 feet. It carries ore of 12 per cent ley—1½ to 2 per cent is considered rich in Cornwall—with occasional pockets of pure cassiterite. Special interest attaches to this group of mines from the up-to-date methods and machinery employed, for it is one of the properties of that romantic figure of Bolivian mining—Don Simon Patiño, the "Tin King" (*Commerce and Finance,* No. 46, Nov. 17, 1915, New York; see also Paul Walle: Bolivia, 1914, Chapter 19).

The recentness of the development and the geographical inertia of the industry have been seconded by economic and industrial limitations. Unlike the Malaysian ore, the Bolivian product contains ferruginous impurity, unremovable by the usual processes of smelting and highly detrimental to its use for plating. But the shock and stimulus of the European war have made themselves felt in this as in other industries of the western hemisphere. Bolivia, too short of motive power to smelt her ores, has entered into agreement with certain American capitalists for the shipment of ores to this country. There they will be smelted by a new electrolytic process in the works at Perth Amboy, N. J., now being erected for the purpose. The establishment of such a current of trade should prove beneficial to a far-reaching degree as a foundation for the establishment of credit and the extension of general commerce between the countries concerned (Bolivian Tin in the United States, *Bull. Pan American Union,* Feb., 1916; *Board of Trade Journal,* Nos. 999 and 1004, 1916). We may look for a marked rise on the figures of 1912, when Bolivia's commerce with the United States comprehended 9 per cent of the imports and one-half of one per cent of the exports. (See also The World's Tin, *Commercial America,* Vol. 12, No. 9, Philadelphia, 1916.)

EUROPE

Geographical Instruction in Great Britain. The growth of geographical education in Great Britain has lately been outlined by Dr. Scott Keltie in the *Geographical Teacher* (Thirty Years' Progress in Geographical Education, No. 38, Vol. 7, Part 4, London, 1914) and the *Scottish Geographical Magazine* (A Half-Century of Geographical Progress, Vol. 31, 1915, No. 12). Under the auspices of the Royal Geographical Society, Doctor Keltie was himself a prime initiator of the new geographical movement that began a little over thirty years ago with an investigation into the position of geography in education. Following the investigation, the stimulus and financial support of the Royal Geographical Society obtained for geography a recognized place in the universities—first in Oxford, where a notable beginning was made under the guidance of Mackinder, a little later in Cambridge and London, and subsequently in other universities and colleges, until now geography has an academic standing in practically every center of higher education. Its university status may be found in detail in the *Geographical Teacher* (Geography in British Universities, No. 37, Vol. 7, Part 3, 1913): the several syllabuses show the breadth of the instruction. By degrees the new geography

permeated from the colleges to the secondary and primary schools. The Geographical Association, organized in 1893 and now numbering over a thousand members, has afforded material aid by its investigations and recommendations and by its publications, including, since 1901, the *Geographical Teacher*. By 1905 the Board of Education had been aroused to a need for geographical education in the secondary schools. The new regulations of that year required the devotion of a specified amount of time to regular work in geography. Now geography is provided for in a four years' course intended to cover a complete world survey. In primary education less has been accomplished because of the difficulty in securing properly trained teachers. The fault lies chiefly with the training colleges, where until very recently geography figured in the program—often merely nominally in combination with history. Since 1913 geography has been promoted to a position of general and definite instruction.

Geography has thus secured a place in scholastic curricula: the future work of the teacher lies in the interpretation of its broad and far-reaching aims. An important trend of this interpretation appears in two recent articles by Dr. H. J. Fleure of the University College of Wales, Aberystwyth. "Suggestions for Investigations in Human Geography in Britain" (*Geographical Teacher*, No. 37, Vol. 8, Part 3, 1913) outlines a scheme for local geographic study. Its striking interest lies in the morphological standpoint taken. The point of view is discussed in the second paper, "Regional Surveys in Relation to Geography" (*ibid.*, No. 42, Vol. 8, Part 2, 1915), originally delivered as an address at the Imperial Institute in connection with Professor Geddes' Provisional Committee for the Development of Regional Surveys. A plea is made for humanistic treatment, under which geography can be made "a potent spiritual influence, promoting refinement of thought and breadth of appreciation, and thus contributing most effectively to good citizenship."

Atmospheric Pollution in England and Scotland. The results of observations made with a standard type of dust and soot collecting gage in English and Scotch towns are interesting. The maximum fall of soot and dust was recorded in Oldham, where the amount was 31.2 metric tons per square kilometer per month. Manchester comes second, with 26.8 metric tons. The Oldham fall is equivalent to 957 tons (British?) per square mile per annum. The figure for Sheffield is 21.7 metric tons per square kilometer per month. Our own Pittsburg has 33.6. R. DeC. Ward.

Navigation in the White Sea. The conditions affecting navigation in the White Sea—a subject which the war has made of vital importance to Russia (see "Russia's War-Time Outlets to the Sea," in the February *Review*, Vol. 1, pp. 128-132)—are discussed by Monsieur Gilinsky in the February, 1916, number of the *Bulletin of the Imperial Russian Technical Society*, whose article is summarized by J. Vichniak in the June 15 issue of the *Revue Générale des Sciences* (p. 330).

According to this article the White Sea is far from being inaccessible to all-year traffic. The summer freedom from ice continues until January (see also, below, note on "Ice Conditions in the Arctic Seas in 1915.") About this time, ice begins to form along the mouth of the rivers flowing into the sea and gradually extends outwards toward deep water. But this ice rarely exceeds an average of 20 inches in thickness and it is generally porous and brittle. Winds and currents combine to maintain it in a crushed condition. The ice banks of the open sea also make their appearance at the beginning of the year but they are seldom continuous, and navigation is possible during the months of February and March, when freezing attains its maximum.

The real dangers to navigation begin when the melting period sets in. Even then, however, the use of ice-breakers makes the White Sea harbors accessible to commerce. In spring, as a rule, the brittleness of the ice becomes marked in the upper layers, while the submerged portions acquire greater strength on account of the lower temperature then prevailing in the lower sections of the water. By May, however, the White Sea is free of ice. This often happens earlier, especially whenever winds from the west or southwest have prevailed in April.

According to recent *Commerce Reports* (July 24, 1916) a great rush of steamers to White Sea ports occurred this season. The ports of Soroka and Kem, both of which are now connected by broad-gage tracks with Petrograd, are fast becoming busy centers of shipping. Archangel, however, leads, owing to better connections with inland districts. It is estimated that over 2,700,000 tons of cargo will be transported inland from this port during the present season.

A Projected Southern Transcontinental Railroad in Europe. Attention is called to the projected Simplon-Belgrade railroad route in an article on "The Adriatic Slavs and the Overland Route to Consantinople" by Sir Arthur Evans in the April, 1916,

number of the *Geographical Journal.* The line will pass through non-Teutonic territory, Switzerland, Italy, and the Slavic districts of Austria being traversed until Belgrade is reached. East of the Istrian peninsula two routes, passing respectively by Laibach or Fiume, are available. Railroads are now in operation along the greater part of the stretch, and the linking of the necessary connections can be undertaken without difficulty.

The establishment of this line would revive the ancient route between the East and West which followed the Save valley. It is estimated that thirty-nine hours will suffice to bring the tourist from London to Belgrade—a saving of five hours over the time taken by the Orient Express before the war. Another advantage which might appeal to travelers is that this line attains the sea midway, at Venice and Fiume.

Now that continental connection with the Greek system of railways has been established (see the September *Review,* p. 227), the construction of this new transcontinental line would link the port of Piræus with a rapid route to England. From the Greek harbor to Port Said the time of travel is approximately twenty hours less than from Brindisi. A future rapid route to the East might be created by these connections and serious competition to the line following the Danube valley created.

The Quaternary Snowline in the Iberian Peninsula. In connection with glacial field work during the summers of 1914 and 1915, Hugo Obermaier and Juan Carandell made observations on the past and present snowline of the mountain ranges of Spain and Portugal, the results of which they have recently published (Datos para la Climatologia Cuaternaria en España, *Bol. Real Soc. Españ. de Hist. Nat.,* Vol. 15, 1915, pp. 402-410, Madrid). Two suggestive profiles through the Iberian Peninsula are presented, one from east to west approximately along the 41st parallel, and the other from north to south along the 5th meridian west of Greenwich, the latter extended so as to include the Atlas ranges of Morocco. The profiles show that the Quaternary limit of perpetual snow increased progressively in elevation from north to south in the peninsula, and from east to west, the former in keeping with the latitudinal effect on climate, the latter due to the change from the marine climate of the west coast to the dry land-climate of the interior.

The profiles are summarized in the following two tables.

E-W Profile			N-S Profile		
Range	Maximum elevation	Elevation of Quaternary snowline	Range	Maximum elevation	Elevation of Quaternary snowline
Serra da Estrella	1991 m	1400-1500 m	Picos de Europa	2672 m	1400-1500 m
Sierra de Béjar	2401 m	1800 m	Sierra de Guadarrama	2406 m	2000-2050 m
Sierra de Gredos	2592 m	1800-1900 m	Sierra de Gredos	2592 m	1800-1900 m
Sierra de Guadarrama	2406 m	2000-2050 m	Sierra Nevada	3481 m	2400-2500 m, N slope 2600-2700 m, S slope
Montes Universales	1610 m	mountains too low to be within reach	Er Rif	2200 m	mountains too low
Sierra de Javalambre	2020 m		Middle Atlas	4000 m	3280 m, N slope 3480 m, S slope
Peña Golosa	1813 m		High Atlas— Ari Ayash	4250 m	3700 m, N slope 3900 m, S slope
			Tizi-n-Tamdjurt	4600 m	4400 m, N slope 4500 m, S slope

In the second table, the interruption of the progressive rise due to the lower elevation of the Sierra de Gredos snowline is a local variation due to the fact that this range is higher than the Sierra de Guadarrama, which is in the same latitude, and consequently carries a larger and more persistent snow cover.

The values with regard to the Atlas ranges are hypothetical. They have been obtained by prolonging southward the ascending line which passes through the snowline of the Iberian ranges. In addition, allowance has been made for the greater elevation of the snowline on the southern as compared with the northern slopes and for the effects of increased dryness on approach to the desert. The known difference for the Sierra Nevada, 200 meters, has been applied to these ranges, with the result given in the table. These figures, pending field work, afford a working approximation, which, incidentally, is in the nature of a compromise between the view which assumes that the Atlas ranges bore no glaciers in Quaternary time and the opposite assumption that they were glaciated down to a level of 1,800 meters.

ASIA

Strategic Geography of the Gallipoli Campaign. The southern shores of the Dardanelles and the entire Troad region form the subject of an illuminating article contributed by Dr. Walter Leaf to the June number of the *Geographical Journal* (pp. 401-421). Having had the advantage of personal experience on the site which he describes, Doctor Leaf is able to show all the more clearly how intimately the problem of forcing the straits depended on their physical features.

A fact rendered obvious by experience, and one which the geographer might have pointed out long before any action was undertaken, is that no naval effort could meet with success against the obstacles placed by nature in this region. The passage of a narrow tortuous waterway, 30 miles long, guarded by a complicated system of abrupt heights, as well as by a strong current down which mines float readily, was an impossibility. Among the difficulties which lay in the way of the Franco-British expeditionary force were a system of Tertiary cliffs running between Lampsacus and the entrance of the straits. This formation consists of clayey and sandy marls. While not exactly precipitous, they are steep enough to prevent landing except in occasionally intervening short stretches of coastal plain. These clays and marls become a real obstacle in the western approaches to the Troad, where they guard the southern coast from the mouth of the Dardanelles. Besika Bay, on this coast, is available as a landing station, but its value as the base of an expeditionary force is annulled by a line of marches which render advance towards the plain of Troy extremely hazardous. The only practical approach to the plain of Troy, according to Doctor Leaf, is found on the north coast of the Troad near the entrance of the Dardanelles. The military history of the region is instructive on this point, and enlightening references to the procedure adopted by ancient armies abound in the article.

A New Siberian City. Progress in the settlement of Siberia is the theme of two articles (''Rapid Growth of Siberia'' and ''Siberian Village Life'') in the Russian Section of the *London Times* for August 26, 1916. The particular case reviewed is the extraordinary growth of Novo-Nikolayevsk on the Ob River where it is crossed by the Trans-Siberian railroad. The recent completion of the Altai railroad, which runs from Novo-Nikolayevsk to Barnaul, with a branch to Biisk on the upper Ob, and to Semipalatinsk, thus tapping rich agricultural and mining districts, has further stimulated the city's growth. The writer, who visited the spot in 1898, then found that ''a small railway car, dismantled and propped up alongside the track, did duty for a railway and telegraph station,'' while ''about one mile away on the river's bank a tiny collection of unpainted log huts'' represented the sole population of the district. Now on this site is a town of 100,000 people, and, unlike most of the older Siberian cities, it is essentially modern. It has well-paved streets, electric lighting, and many fine stone buildings. Land purchasable in 1898 for 1 rouble per desiatin (2.7 acres) now sells at half as much per square foot. Novo-Nikolayevsk owes its growth to its position as a ''window to Europe'' for the vast Altai region. Its citizens hopefully anticipate further progress with construction of the projected railway line from the lower Ob to the White Sea or direct to the Arctic, when the town will naturally become a transshipping center for the upper river.

Foreign Commerce in the Philippines. With a total value of a little under $61,500,000, representing an approximate gain of 25 per cent on the average of the last five years, the Philippine export trade of last year constitutes a record (advance report on Philippine Foreign Commerce in the Year Ending June 30, 1916, Bureau of Insular Affairs, Washington, D. C.). Excepting copra, which was still suffering from the effects of the droughts and typhoons of the preceding season, all important export products showed an increase both in amount and value. This was notably the case with hemp and the allied fiber, maguey, and sugar. The increase in sugar is especially remarkable, the export for the first time exceeding the maximum of 1893. The sugar industry, decadent during the early days of American control, began to recover in 1909 under free trade with the United States and has lately been helped by war conditions. To the stimulus of the latter may be accounted the increased shipments to the Orient and the entirely new trade with the United Kingdom. The import trade, though improved over that of the previous year, remained below normal. The only important gains were made with the United States, Japan, and French Indo-China. The last named is attributable to heavy imports of rice to meet the shortage following the drought of 1914, and the increased Japanese business is partly due to the coal trade taken over by that country from Australia.

POLAR REGIONS

Ice Conditions in the Arctic Seas in 1915. Ice conditions in the Arctic were not uniform in 1915, according to a report by C. I. H. Speerschneider entitled "The State of the Ice in the Arctic Seas, 1915," recently issued by the Danish Meteorological Institute in its *Nautisk Meteorologisk Aarbog* for 1915.

Around Spitzbergen navigation was somewhat more arduous than in previous years. Spring opened with the promise of a severe icy season. In June the ice along the west coast covered an area larger than that of the island. According to sealers' reports the floes were packed so closely that they prevented approach to the fiords. The coast was blocked farther north than Prince Charles Foreland. These conditions are rarely witnessed; since the inauguration of the institute's investigations in 1897, it has been a rare occurrence for the ice to extend west of 10° E. A slight amelioration was observable in July, although all the west coast was ice-bound in August. Relatively favorable conditions existed on the north coast, but sailing north around North East Land or through Hinlopen Strait was impossible.

An improvement in White Sea conditions was attained in 1915 by the steady use of ice-breakers. Navigation was thus open till the end of the year. The ice in Barents Sea was normal except around Bear Island. An unusual southerly extension of ice is recorded for the period between April and June. Not until the end of this last month was the water around the island open.

In Iceland, polar ice east of Cape North hindered steam navigation in and out of the northwest fiords in the early spring of 1915. The ice then spread northward to such an extent that in June traffic round Cape North and adjacent stations was blocked. It was only in the last days of July that the sea was open on the north coast of Iceland. This favorable condition prevailed for the rest of the year.

The eastern coast of Greenland was normal. Ships had easy access to Angmagsalik station from the autumn of 1914 to August, 1915. On the northern part of the west coast the land floes of April and May gave way to open ice from June onward, and the release of icebergs became marked in July. In Smith Sound a severe winter was experienced, but the ice commenced breaking earlier than usual in May.

The Newfoundland Banks had less ice than in 1914. The southernmost iceberg was seen on May 5th in 39° 53′ N. and 47° 24′ W. Very few icebergs reached 40° N., however.

North of Alaska, conditions in the Beaufort Sea were normal. In spring the sea was frozen over near Banks Land. The passage through Bering Strait was free of ice during fall.

Probable Loss of Two Russian Arctic Expeditions. The probable fate of the Rusanoff and Brussiloff expeditions has already been referred to (*Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, pp. 53-54, 288, and 961). Both were sent out under the auspices of the Archangel Society for the Study of the Russian North. The former left Spitzbergen in the motor boat *Hercules* in August, 1912, for Nova Zembla; the latter left a month later. After two years had elapsed without news from either, the Russian government sent out the Norwegian vessel *Eclipse* under Captain Sverdrup in July, 1914, to rescue the missing expeditions. The *Eclipse* returned to Archangel in September, 1915, without any news of the missing expeditions. Since then another year has passed without news, and the Russian government has therefore just announced through the medium of the Canadian government (press despatch from Ottawa dated September 8) that it officially considers both expeditions lost.

WORLD AS A WHOLE AND LARGER PARTS

The Japanese Abroad. A critical interpretation of Japanese emigration statistics, presented by R. Biasutti in the April-May, 1916, number of the *Rivista Geografica Italiana*, reviews the conditions under which the movement is taking place. The same topic was discussed in detail in an article entitled "Die Japanische Auswanderung" by Dr. Ernst Schultze in *Petermanns Mitteilungen* for April, May, July, and August, 1915 (see comment on map in *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, p. 727). Basing himself on figures for the year 1911, Biasutti assumes that about 800,000 Japanese are now scattered outside their native land. Of these one-half have invaded Sakhalin, Korea, and Formosa. In Asiatic countries the inflow of Japanese residents has become distinctly a phase of economic penetration. China alone contains over 130,000 Japanese immigrants, of whom a good half consists of women. Inasmuch as the ratio of male to female colonists is the criterion of permanent or temporary settlement, it follows that the Japanese generally go to China with the intention of taking up a permanent abode. On the eastern coast of the Pacific, however, the proportion of women among the immi-

grants is relatively low, the highest percentage being 23.7 for Mexico, while for Peru it is as low as 3.8. This figure becomes 12 per cent in the United States and increases to 17 per cent in Canada. In the Hawaiian Islands it attains 36.5 per cent.

The importance of the Japanese penetration in China can be realized from the fact that 60 per cent of the total number of emigrants in Kuantung and the Manchurian sphere of Japanese influence belong to the leading and industrial or commercial classes. The first-named of these localities contains between 45,000 to 50,000 Japanese inhabitants, while the second follows closely with about 40,000. Within the Russian sphere of influence in Manchuria the number of Japanese dwindles rapidly and rarely exceeds 2,000.

Anglo-Saxon America as a field of colonization for the Japanese is closed. Not so, however, with Latin-America, which the Asiatic islander is free to enter, but where he rarely elects to become permanently domiciled. Brazil alone, among the Latin-American states, has attracted the Japanese farmer. In the countries of Spanish speech he usually appears as a trader or a laborer. An agriculturist in Brazil, he also becomes a settler, the fact being revealed in the percentage of Japanese women in this republic —a figure which in 1911 was as high as 41. Most of this Japanese colonization in Brazil is confined to the state of São Paulo and is due to the possibility of rice cultivation.

Uniform Pan-American Monetary Unit. A recent issue of the *South American Journal* (Vol. 80, No. 24, London, 1916) discusses the Pan-American monetary unit proposed at the conference lately held in Buenos Aires. The proposal was to create a standard coin, equivalent in value to one-fifth of the United States dollar, for general circulation in the countries of the Pan-American Union. Apart from theoretical considerations as to the desirability of such a measure there are pronounced practical difficulties dependent chiefly on the debased condition of the monetary currency in many of the Latin-American republics. The great development of Argentina's resources has indeed placed that country on an unusually favorable footing among her sister republics, but it is exceptional. Most of the smaller countries, especially some of Central America, are still in states of indebtedness and monetary trouble from which they can only emerge by an economic progress that must inevitably be of slow growth.

PHYSICAL GEOGRAPHY

Fluctuations of Solar Radiation. The importance of fluctuations of solar radiation —regular or irregular, in long periods or in short periods—in relation to "changes" of climate, gives a distinct geographic interest to such work as that carried on by the Astro-Physical Observatory of the Smithsonian Institution. In his Annual Report for the year ending June 30, 1915, Dr. C. G. Abbot, the Director, points out that short-period fluctuations of solar radiation were large in 1913, but small in 1914. In association with these rapid, irregular fluctuations there are variations of contrast of brightness between the center and edges of the sun's disk. Greater contrast is associated with greater solar radiation and with numerous sunspots in the general march of the sun's activity; lesser contrast is associated with greater solar radiation in the march of the quick, irregular fluctuations of the sun's emission. Two causes of solar variation seem to be indicated by this paradox. The long period changes may be caused by changes of the sun's effective temperature attending the march of solar activity. The quick fluctuations may be ascribed to changes in the transparency of the outer solar envelopes.

R. DeC. Ward.

GEOGRAPHICAL NEWS

Weather Charts of the North Atlantic Ocean. Beginning with the issue for August, 1915, the successive numbers of the *Monthly Weather Review* have contained charts showing the weather conditions over the North Atlantic Ocean, for the same month, but one year previously. These charts give the averages of pressure, temperature, and prevailing wind directions at Greenwich mean noon, together with the location and courses of the more severe storms of the month. The discussion summarizes the more important meteorological conditions, with special reference to the storms which crossed the North Atlantic.

R. DeC. Ward.

Personal

Mr. O. P. Austin, assistant chief of the Bureau of Foreign and Domestic Commerce, will give a lecture on South America on November 7 at Public School 132, Manhattan.

Mr. F. W. Cowie, chief engineer of the Harbour Commissioners of Montreal, read a

paper on "Canadian Ports" at the Fifth Annual Convention of the American Association of Port Authorities held in Montreal on September 13, 14, and 15.

Dr. P. H. Gallé of the Dutch Meteorological Office read a paper on January 29 before the Academy of Sciences of Amsterdam entitled "On the Relation Between the Summer Changes of the North Atlantic Trade Winds and Winter Temperature in Europe."

Miss Caroline W. Hotchkiss of the Horace Mann School, New York, will give a course of five lectures on "Great Cities" at the 96th Street Branch of the New York Public Library, Manhattan. The dates and subjects of the lectures are as follows: October 2, Gary, the City Made to Order; October 9, New Orleans and Its Debt to the Mississippi; October 16, Denver the Gift of the Plains and the Mountains; October 23, San Francisco by the Golden Gate; October 30, Portland and the Columbia River. The subject of these lectures is substantially that dealt with in Miss Hotchkiss' book "Representative Cities of the United States" (reviewed in the *Bull. Amer. Geogr. Soc.*, Vol. 46, 1914, p. 776).

Sir John Kennedy, consulting engineer of the Harbour Commissioners of Montreal, read a paper entitled "St. Lawrence River and Canals of Canada" at the Fifth Annual Convention of the American Association of Port Authorities, held in Montreal on September 13, 14, and 15.

Dr. Willis T. Lee of the U. S. Geological Survey gave an address on "The Birth of the Rockies" before the Colorado Academy of Sciences in Denver on September 26.

Professor Emmanuel de Martonne, professor of geography in the Sorbonne, arrived in New York on September 18 to take up his work as visiting French professor at Columbia University. He will give courses on European physiography under the auspices of the Department of Geology. His offerings will include two courses of four lectures each, delivered in French and open to the public. The subjects and dates of these lectures are: (1) Montagnes du Centre et Sud de la France, 4.15 P. M. (Massif Central) October 19 and 26, November 2, and (French Alps) November 9; (2) Plaines et Champs de Bataille du Nord de la France, 8.15 P. M., November 15, 22, and 29, and December 6. In connection with this series of lectures, there will be conferences, open to advanced students, in which a detailed study of certain phases of the work will be made. Professor De Martonne will also co-operate with Professor D. W. Johnson in a course on the physiography of Europe, in which the Alps, the Carpathians, and southeastern Europe will be discussed by Professor de Martonne.

Prof. E. S. Moore of the Pennsylvania State College lectured before the Mining and Geological Society of Lehigh University on April 13 and before the students of the department of geology at Cornell University on April 26 on "Some of the Mining Fields of Australia and India."

Dr. Francis Rolt-Wheeler will give a course of six lectures at Public School 61, Manhattan, dealing with the activities of various government bureaus. The dates and subjects of his lectures are as follows: October 6, U. S. Geological Survey; October 20, U. S. Forest Service; November 3, U. S. Reclamation Service; November 17, U. S. Bureau of Fisheries; December 1, U. S. Bureau of Indian Affairs; December 15, U. S. Immigration Office.

Mr. A. D. Swan, consulting engineer of Montreal, read a paper on "Some Ports on the West Coast of South America, and Their Future Development" at the Fifth Annual Convention of the American Association of Port Authorities held in Montreal on September 13, 14, and 15.

Dr. J. J. H. Teall, F.R.S., late director of the Geological Survey of Great Britain, received the honor of knighthood on the occasion of King George's birthday.

GEOGRAPHICAL PUBLICATIONS

(Reviews and Titles of Books, Papers, and Maps)

For key to classification see ''Explanatory Note'' in the July number, pp. 77-81

NORTH AMERICA

UNITED STATES

South Atlantic States

—— **Eagle Rock, Virginia, sheet.** [*Topographic map of the United States.*] 1:62,500. Surveyed in 1908 and 1913; edition of 1915. U. S. Geological Survey, Washington, D. C. [An excellent illustration of the topography characteristic of three-cycle folded mountains. Parallel ridges of moderately even crest preserve a suggestion of the so-called Cretaceous peneplane of the Appalachian Mountain province, while the Tertiary peneplane is well preserved in the lowlands, except where the beautiful entrenched

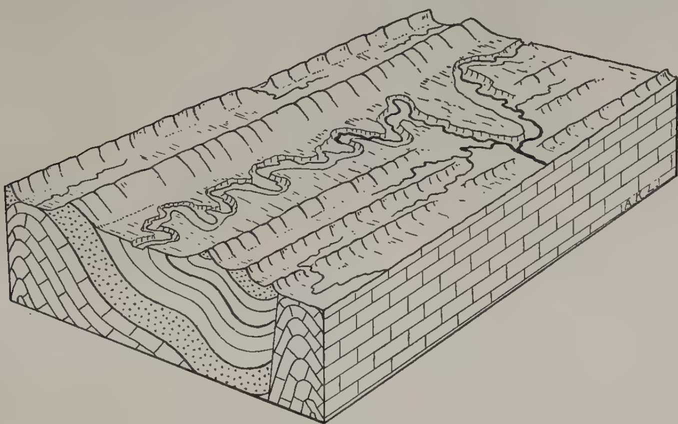

FIG. 1—Block diagram of the region about the headwaters of the James River, Virginia, from the Eagle Rock, Va., topographic sheet. Drawn by A. K. Lobeck.

meanders of the James River and its branches have opened out a post-Tertiary trench from one-fourth to one-half mile broad. Trellis drainage, water gaps, an occasional wind gap, and abandoned meander courses are well represented. The accompanying diagram is based on the northwestern two-thirds of the Eagle Rock sheet and shows the essential features of the region mapped.—D. W. J.]

North-Central States

SCHOCKEL, B. H. **Settlement and development of Jo Daviess County.** Maps, diagrs., ills., bibliogr. *Illinois Geol. Survey Bull. No. 26*, pp. 173-228 (Chapter 10). Urbana, 1916.

The dominant influences in the earlier settlement of Jo Daviess County (in the extreme northwestern corner of Illinois) were its mineral wealth and its location on the east bank of the Mississippi. Desultory Indian mining began to acquire significance with the advent of the white man. Early in the eighteenth century lead became a regular article of commerce between the Indians and the French traders. Galena, favorably situated on a navigable stream close to its confluence with the Mississippi, grew to prominence as a trading post. No very serious exploitation was undertaken until 1823: then the boom commenced and the usual influx of population followed.

It was estimated that the entire mining region of the Upper Mississippi contained not less than 10,000 miners in 1830, a cosmopolitan crowd including many Irish and men from the declining mines of Cornwall. The output grew enormously. The region contributed the major part of the supply that, in 1845, put the United States into the

foremost position as a world-producer of lead, whereas only fifteen years before she had been importing from Europe. As late as 1852 and even after rapid decline in output the region still accounted for 87 per cent of the country's total. Decay ensued with exhaustion of the richer and more accessible ores and was accelerated by the rival attractions offered by Californian gold and Lake Superior copper and also by internal changes favoring the development of agriculture and the progress of improvement works in the state. The fortunes of mining and farming were always more or less complementary. Farming was originally tributary to the mineral industry. It prospered most during periods of depression in the mines, but its progress was steady. By 1840 the number of farmers in the county exceeded the miners, and a few years later the regular export of agricultural produce was begun. Real agricultural expansion took place with the opening up of eastern routes. The county secured a portion of the migration from the North Atlantic states, although, located in the driftless area and possessing rough topography and poor soil it did not, as an agricultural district, compare favorably with adjacent lands.

The county naturally faces south. Its early intercourse was almost exclusively via the Mississippi; its early organizations and institutions had a Southern aspect. Exceptionally, a commercial outlet was found to the St. Lawrence, as in the days of the first French-Canadian traders, during the first readjustments following the Louisiana Cession, and still later for the supply of bullets to the English during the War of 1812. Eastward the vast extent of unsettled prairie barred the way until the construction of the Erie Canal and the establishment of steam navigation on the Great Lakes shortened tremendously the time and cost of transportation. The Illinois and Michigan Canal (1848) also accomplished something towards the eastward diversion of trade that was finally sealed by the construction of the railroad between Chicago and Galena in 1855. Not long after, in the Civil War, the eastern routes acquired a strategic importance as lines of communication transmitting food products and lead to the forces of the North.

Since 1870 the county has declined in population and general productivity. The decline has been greatest in the lead-producing townships. Data on property, land values, and so forth "seem to imply in some ways the economic inferiority of the mining to the non-mining townships." Further study of the problem here presented would be interesting.

There is a full list of bibliographic references, but many parts of the text have too much merely encyclopedic information unrelated to either real history or geography.

Clark, D. E. **The westward movement in the Upper Mississippi Valley during the fifties.** *Proc. Mississippi Valley Hist. Assoc. for the Year 1913-14* (Vol. 7), pp. 212-219. Torch Press, Cedar Rapids, Ia., 1914.

Condit, D. D. **Structure of the Berea oil sand in the Summerfield quadrangle, Guernsey, Noble, and Monroe Counties, Ohio.** Maps, diagrs., bibliogr. *U. S. Geol. Surv. Bull. 621-N*, pp. 217-231. Washington, 1916.

Condit, D. D. **Structure of the Berea oil sand in the Woodsfield quadrangle, Belmont, Monroe, Noble, and Guernsey Counties, Ohio.** Maps, diagrs., bibliogr. *U. S. Geol. Surv. Bull. 621-O*, pp. 233-249. Washington, 1916.

Freeman, O. W. **A geographic study of the growth and distribution of population in Michigan.** Maps. *Fifteenth Rept. Michigan Acad. of Sci.*, pp. 39-53. Lansing, 1913. [Maps for each decade since 1820 showing population by townships.]

Gardner, J. H. **A stratigraphic disturbance through the Ohio Valley, running from the Appalachian Plateau in Pennsylvania to the Ozark Mountains in Missouri.** Map. *Bull. Geol. Soc. of America*, Vol. 26, 1915, No. 4, pp. 477-483.

Grover, N. C. **Surface water supply of the United States, 1914. Part 5: Hudson Bay and Upper Mississippi River basins.** xxix and 247 pp.; ills., index, bibliogr. *U. S. Geol. Surv. Water-Supply Paper 385*. Washington, 1915.

Harper, R. M. **Car-window notes on the vegetation of the Upper Peninsula.** *Fifteenth Rept. Michigan Acad. of Sci.*, pp. 193-198. Lansing, 1913.

Hopkins, C. G., J. G. Mosier, E. Van Alstine, and F. W. Garrett. **Winnebago County soils.** 76 pp.; maps, ills., bibliogr. *Univ. of Illinois Agric. Exper. Sta. Soil Rept. No. 12.* Urbana, 1916.

Kay, F. H. **Petroleum in Illinois in 1914 and 1915.** *Illinois Geol. Survey Bull. No. 33*, pp. 7-25. Urbana, 1916.

Mears, L. W. **The sod house as a form of shelter: Where? what? why?** Bibliogr. *Journ. of Geogr.*, Vol. 14, 1915-16, No. 10, pp. 385-389.

—— **Minnesota Educational Association, committee on elementary course of**

study of the, Report of the, on elimination of subject-matter in arithmetic, American history, composition, English grammar, geography, and reading. 15 pp. *Minnesota Dept. of Educ. Bull. No. 51.* Minneapolis, 1914, reprinted, 1915.

QUICK, B. E. **The pine hills at Lowell, Michigan.** *Fifteenth Rept. Michigan Acad. of Sci.*, pp. 145-146. Lansing, 1913.

SAVAGE, T. E. **Geologic structure of Canton and Avon quadrangles.** Maps, diagrs. *Illinois Geol. Survey Bull. No. 33*, pp. 27-36. Urbana, 1916.

SHERMAN, L. K. **Illinois River flood.** Diagr. *Engineering News*, Vol. 75, 1916, No. 12, pp. 550-551.

SMITH, R. A. **The Saginaw oil field.** *Fifteenth Rept. Michigan Acad. of Sci.*, pp. 33-38. Lansing, 1913.

STREIGHTOFF, F. D., AND F. H. STREIGHTOFF. **Indiana: A social and economic survey.** With a chapter on charities and corrections by C. C. North. 261 pp. 9½ x 6½. [First five chapter headings read: The Physical Basis; Trees; Agriculture; Manufactures; Transportation.]

THWAITES, R. G., edit. (1) **The fur-trade in Wisconsin, 1812-1825**; (2) **A Wisconsin fur-traders' journal, 1803-04**, by Michel Curot. Ills., index. *Collections of the State Hist. Soc. of Wisconsin*, Vol. 20, pp. 1-395 and 396-471, respectively. Madison, 1911. [The Wisconsin Historical Society has undertaken the publication of a selected body of documentary material for first-hand study of the Wisconsin fur trade. This, the second volume, embraces the critical transition period between the years 1812-1825. American governmental control of the Northwest posts (1796) wrought little change until the War of 1812. Under the strain of political as well as commercial rivalry the old régime broke down, resolving itself into a struggle between the Government fur trade factories, the private traders, and the great American and Canadian companies. The period terminated with the triumph of the last.]

UPHAM, WARREN. **Explorations and surveys of the Minnesota and Red Rivers.** *Proc. Mississippi Valley Hist. Assoc. for the Year 1913-14* (Vol. 7), pp. 82-92. Torch Press, Cedar Rapids, Ia., 1914.

WILL, G. F. **The Cheyenne Indians in North Dakota.** *Proc. Mississippi Valley Hist. Assoc. for the Year 1913-14*, Vol. 7, pp. 67-78. Torch Press, Cedar Rapids, Ia., 1914.

SOUTH AMERICA

GENERAL

MOSES, BERNARD. **The Spanish dependencies in South America: An introduction to the history of their civilisation.** Vol. I, xxvi and 394 pp.; Vol. II, ix and 44 pp., index. Harper & Brothers, New York, 1914. 9 x 6.

As one of the few works of its kind written in English and as the mature result of long scholarly labor in the field to which it pertains, this book is welcome. In it is presented an account of what Professor Moses terms the middle period (1550-1730) of Spanish rule in South America—that "marked by the organization and development of political societies dependent on Spain." More than half the first volume, however, is concerned with the first period, that of the discoveries and great explorations. These introductory chapters are largely composed of material, selected and rearranged, from the author's earlier work, "Establishment of Spanish Rule in America," published in 1898.

The method is tropical in treatment, but as there is no conscious recognition of the fundamental importance of geographic relations the geographer must hunt through many weary pages to find material—and there is such—that will prove of interest to him. Under such circumstances one particularly deplores the lack of an organized and annotated bibliography that would allow further pursuit of the outcropping points of interest. To give one illustration: In the chapter on Travel and Transportation there is allusion to and quotation from "a letter dated August 3, 1729 (of) Padre Gervasoni" (Vol. 2, p. 388), but no clue as to where this seemingly interesting document may be found. The footnotes carry references to important and in some cases little-known source material, but they are disposed in so desultory and erratic a fashion that their use must be laborious or fortuitous.

ALBES, EDWARD. **Yerba mate, the tea of South America.** Ills. *Bull. Pan American Union*, Vol. 42, 1916, No. 5, pp. 625-643.

CLOSE, C. F. **Gravity deflections in the Andes.** Diagr. *Geogr. Journ.*, Vol. 47, 1916, No. 6, pp. 464-467.

DAY, L. G. **South American Trails.** Ills. *Amer. Museum Journ.*, Vol. 16, 1916, No. 1, pp. 23-44.

—— **Latin American description and history, Books and magazine articles on, received in the Columbus Memorial Library of the Pan American Union: Supplement No. 2.** 136 pp. The Pan American Union, Washington, 1914. [The original list was printed in 1907 and Supplement No. 1 in 1909.]

REID, W. A. **Motor cars and highways in South America.** Ills. *Bull. Pan American Union,* Vol. 42, 1916, No. 5, pp. 644-665.

REID, W. A. **Navigation on South American rivers.** Ills. *Bull. Pan American Union,* Vol. 43, 1916, No. 1, pp. 13-32.

SIMMONS, R. E. **Lumber markets of the east coast of South America.** 121 pp.; ills. *Bur. of Foreign and Domestic Comm. Special Agents Ser. No. 112.* Dept. of Commerce, Washington, D. C., 1916. [Abstracted in this number, pp. 304-306.]

SIMMONS, R. E. **Lumber markets of the west and north coasts of South America.** 149 pp.; map, ills. *Bur. of Foreign and Domestic Comm. Special Agents Ser. No. 117.* Dept. of Commerce, Washington, D. C., 1916. [Abstracted in this number, pp. 304-306.]

SPINDEN, H. J. **The question of the zodiac in America.** Ills., bibliogr. *Amer. Anthropologist,* Vol. 18, 1916, No. 1, pp. 53-80. [Was the zodiac a conception among pre-Columbian Aztecs, Mayas, and Incas? Probably not.]

EUROPE

BRITISH ISLES

CRESSY, EDWARD. **An outline of industrial history, with special reference to problems of the present day.** xiv and 364 pp.; diagr., index, bibliogr. Macmillan & Co., Ltd., New York, 1915. $1.10. 7½ x 5.

The past, about which the historians write, is dead. They especially aim to make it so in order that they may maintain that much-sought impartiality which history is supposed to possess. Thus the school book of history drops the boy off a generation or two ago and modern society demands that he go out and vote intelligently on the questions of the day. The interval between his school history and his ballot box is covered by a maze of governmental reports, monographs, and current, dilute, biased, usually ephemeral publications. Mr. Cressy's book is an attempt to guide the young Briton through this critical period and help him to understand the present.

There are eighteen chapters divided into groups. Under "Scientific and Technical Progress," chapters on food and farming, textiles, fuel, and science in industry cover 128 pages; facilities for commercial development, 55 pages; the evolution of industrial management, 37 pages; industry and politics (franchise, factory legislation, education, etc.), 75 pages. Lastly comes a carefully selected list of 76 books, by which the elementary student may extend his knowledge in particular fields. The frontispiece, a chart showing British population for eight centuries, is most striking. The book has been carefully prepared and gives an excellent brief review of British industrial history.

J. RUSSELL SMITH.

ANGELBECK, A. **Staffordshire (The agricultural geography of England on a regional basis, III).** Maps. *Geogr. Teacher,* No. 43, Vol. 8, 1915, Part 3, pp. 154-163.

BONE, LUCY. **Experimental work with young children on the Ordnance Survey map of the district of Sutton, Surrey.** Maps. *Geogr. Teacher,* No. 43, Vol. 8, 1915, Part 3, pp. 188-192.

BRODIE, F. J. **The incidence of bright sunshine over the United Kingdom during the thirty years 1881-1910.** Maps, diagrs. *Quart. Journ. Royal Meteorol. Soc.,* No. 177, Vol. 42, 1916, pp. 23-38.

CLAIBORNE, H. C. **Swansea.** *Suppl. to Commerce Repts.,* Ann. Series, 1916, No. 19b, pp. 11-15. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

CLAXTON, W. J. **An industrial geography of Britain.** 143 pp.; maps, diagrs., ills. George G. Harrap & Co., London, 1915. 9d. 7½ x 5.

CLAXTON, W. J. **Our country's industrial history.** 253 pp.; maps, ills., index. George G. Harrap & Co., London, 1915. 1s. 6d. 7½ x 5.

—— **Coal-fields in England, The search for new.** Map, diagrs. *Nature,* No. 2431, Vol. 97, 1916, June 1, pp. 292-294. ["Abridged from a discourse delivered at the Royal Institution on Friday, March 17, by Dr. A. Strahan, F.R.S."]

Comissopolos, N. A. **On the seasonal variability of rainfall over the British Isles.** Map. *Quart. Journ. Royal Meteorol. Soc.*, No. 177, Vol. 42, 1916, pp. 13-20. [A method of treating rainfall statistics suggested by the paper "Isomeric Rainfall Maps of the British Isles" by H. R. Mill and Carle Salter (*Quart. Journ. Roy. Meteorol. Soc.*, Vol. 41, London, 1915). This alternative method was tried by the author in the course of experimenting on data for the British Isles before applying methods to the discussion of the rainfall of northeastern Africa.]

Cox, A. H. **The geology of the district between Abereiddy and Abercastle (Pembrokeshire).** Maps, diagrs., ills. *Quart. Journ. of the Geol. Soc.*, No. 282, Vol. 71, 1916, pp. 273-342. London. [With colored geological map, 1:15,840.]

Dunlop, Andrew. **On a raised beach on the southern coast of Jersey.** Diagr. *Quart. Journ. of the Geol. Soc.*, No. 282, Vol. 71, 1916, pp. 150-154. London.

Early, W. W. **Leicester Agency.** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 19a, pp. 33-35. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

Elliott, M. S. **The historical geography of the Weald as exemplified round Tonbridge.** Maps. *Geogr. Teacher*, No. 43, Vol. 8, 1915, Part 3, pp. 173-179.

Hale, F. D. **Huddersfield.** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 19a, pp. 21-25. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

H[inks], A. R. **The scientific work of the Ordnance Survey.** *Geogr. Journ.*, Vol. 46, 1915, No. 6, pp. 460-464. [Based on recent publications of that organization.]

Hitch, C. M. **Nottingham.** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 19a, pp. 25-33. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

Isaac, V. K. **The mouth of the river Cuckmere.** Maps, ills. *Geogr. Teacher*, No. 43, Vol. 8, 1915, Part 3, pp. 192-194.

Jones, O. T., and W. J. Pugh. **The geology of the district around Machynlleth and the Llyfnant Valley.** Map, diagrs. *Quart. Journ. of the Geol. Soc.*, No. 282, Vol. 71, 1916, pp. 343-385. London.

Kinvig, R. H. **The historical geography of the West Country woollen industry.** Map. *Geogr. Teacher*, No. 44, Vol. 8, 1916, Part 4, pp. 243-254; Part 5, pp. 290-306.

Rhodes, J. E. W. **Notes on the former courses of the River Devon: A suggested evolution for part of the river system of Fife and Kinross.** Maps, diagrs. *Scottish Geogr. Mag.*, Vol. 32, 1916, No. 5, pp. 209-216.

Savage, J. M. **Sheffield.** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 19a, pp. 35-40. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C. [Includes the progress of industry, e. g. the steel trade of Sheffield, consequent on the war.]

Taylor, S. M. **Birmingham.** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 19a, pp. 11-21. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

Thompson, W. H. **The daily food ration of Great Britain.** *Nature*, No. 2416, Vol. 96, 1916, Feb. 17, pp. 687-690. ["There can be no doubt, and the fact needs reiteration, that the arable land of the United Kingdom is not used to the best advantage in the matter of food production."]

Van Sant, H. D. **Dunfermline.** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 19b, pp. 8-11. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

Austria-Hungary

Krebs, Norbert. **Länderkunde der österreichischen Alpen.** (Series: Bibliothek länderkundlicher Handbücher, herausgegeben von Dr. A. Penck). xv and 556 pp.; maps, diagrs., ills., bibliogr., index. J. Engelhorns Nachf., Stuttgart, 1913. M. 20. 9½ x 6½.

The publishers of Ratzel's monumental "Bibliothek geographischer Handbücher" are undertaking another equally ambitious task. The new project, "Bibliothek länderkundlicher Handbücher," is under the editorial direction of Professor Albrecht Penck. In addition to the volume under discussion, two others have been announced, one on Scandinavia and one on the East Indies. The authorship of the series is international.

The present work by Doctor Krebs on the Austrian Alps is a notable addition to the

literature of regional geography. It is a careful and intelligent piece of work, the fruit of scholarly research on a comprehensive plan. The two chief problems of the author have consisted in following out the geographic factors in a region of great complexity and in resolving the area into coherent subdivisions, convenient for individual treatment. The author has combined the voluminous literature on the eastern Alps with his own intimate knowledge of the region into an account which contains an extraordinary amount of good geographic material. The only serious criticism is that in places geological and especially morphological facts are stressed unnecessarily. The American geographer will be interested to note that the author fears his Continental colleagues will find too little rather than too much of this sort of thing and so deems it necessary to defend the amount of biogeographic material which is introduced.

Alpine conditions are pictured with remarkable clearness. This fact, combined with a diction at the same time vigorous and graceful, and for the most part also terse, make the book as a whole readable. Its utility for reference purposes is enhanced by the consistent and detailed use of section headings. Here and there an Austrian idiom raises difficulties for the reader.

The volume consists of two parts of contrasted treatment. The first part is a summary of the geography of the Austrian Alps as a whole. In the second part eight sub-regions are considered, largely by Davis' method of explanatory description. The first part may be read consecutively, the second part is intended primarily for reference purposes. Pages 8 to 14 are devoted to a suggestive discussion of the possible bases of geographic subdivision and to the scheme by which the sub-regions of the second part were determined.

A large part of the physiographic material in both parts consists of accounts of the manner in which rock formations have expressed themselves in topography and drainage. The nature and causes of soilflow, landslips, and related phenomena receive considerable attention. The topographic effects of climate and vegetation are properly brought out, and a graphic account is given of denudation on the southern slopes of the Alps, with their summer drought and limestone soils.

The great variations of climatic conditions from place to place are the result not merely of varying altitude but of varying disposition of mountain ranges and valleys. Where deep valleys open broadly to adjacent plains, the climate of the lowlands, with some modifications, may penetrate far into the mountains and cause certain passes, as the Brenner, to constitute striking climatic divides. The occurrence of the föhn and the inversion of temperatures in valleys are largely dependent on the position and configuration of the valley. A detailed precipitation map registers the partial exclusion because of mountain barriers of rainfall from certain valleys of western Tyrol. The intensity of insolation and high temperatures of the ground constitute the chief points of contrast between Alpine and polar climate and explain the early period of bloom of the Alpine flora and the rapid ripening of grain in the high valleys.

Chapters 8 to 10, dealing with settlement, economic conditions, and distribution of population constitute the most generally valuable part of the book. The student of European geography or of mountain environment will find here a remarkable wealth of material, which cannot be summarized adequately in a review. A single example therefore is given, the economy of the *alm*. The Alpine peasant distinguishes a number of alms, according to their position. The extension and subsequent contraction of the farm area with the seasons results in a somewhat nomadic domestic economy among the peasants of the alm, and feast-days of the inhabitants are connected with this migration. While the people are on the high alm-meadows they have the brief opportunity of associating with their neighbors from other valleys, and widely attended contests and celebrations result. The alm-meadows are managed most efficiently by common enterprise, so that ancient forms of communistic regulations are still largely observed. In some sections these grasslands have been unduly exploited with the result that stony surfaces appear and lower forms of vegetation are crowding in. Pasturing in forests and the depression of the upper limits of forests through wood-cutting also react unfavorably upon the alm-lands, which are largely at present in a period of depreciation.

The second part contains in disseminated form many notes on human geography. The difficulty of crossing the Arlberg has imparted to Vorarlberg a centrifugal tendency with reference to Austria. Innsbruck, in the east-west Inn Valley, at the northern base of the Brenner Pass, and controlling several routes to Bavaria, has had as the result of its location a long and important history, and is today secure in its supremacy among cities of the Tyrol. Geographic moments in the development of every city of note are established similarly, and the volume closes with an account of the geographic location of Vienna, of the changes in its plan, and of its economic significance.

Mention should be made of several successful cartographic experiments in the detailed representation of the distribution of cultures, of population, and the correspondence

between topography and forms of settlement. The half-tones are supplied with a brief physiographic and geographic explanation. CARL O. SAUER.

FINSTERWALDER, S. **Nachmessungen an Gletschern beiderseits des Brenner im Sommer 1915.** *Zeitschr. für Gletscherkunde,* Vol. 10, 1916, No. 1, pp. 51-56.

FRANCHI, ANNA. **Le città sorelle.** 214 pp. Fratelli Treves, Milan, 1915. 10 x 6. [The "sister cities" of the Italian-speaking borderlands of the Adriatic, including Trieste, Fiume, Pola, the Dalmatian coast towns, and the Italian cities of the "Trentino,"—Trent, Riva, Rovereto. Good illustrations.]

KOCH, NÁNDOR. **Die blaue Grotte von Busí.** Map, ills. *A Tenger,* Vol. 6, 1916, No. 2, pp. 76-81. Budapest. [In Hungarian.]

MAZELLE, EDUARD. **Über die Windverhältnisse in den höheren Luftschichten nach den Pilotballonbeobachtungen in Triest.** *Meteorol. Zeitschr.,* Vol. 33, 1916, No. 2, pp. 64-69.

AFRICA

SOUTH AFRICA

—— **Diamanten, Die deutschen, und ihre Gewinnung; Eine Erinnerungsschrift zur Landesausstellung Windhuk 1914,** herausgegeben von den Förderern. 95 pp., ills. Dietrich Reimer, Berlin, 1914. M. 3. 9½ x 6.

This interesting and elaborately illustrated work was issued in connection with the Windhuk exposition of 1914 and prepared under the direction of the Lüderitzbucht Chamber of Mines and the diamond-mining companies.

The existence of great diamond deposits in British South Africa naturally led to prospecting in German Southwest Africa, resulting in the discovery of some "blue ground" but no promising amount of diamonds. About 1908 reports were circulated of the discovery of diamonds near Lüderitzbucht, but they were received with scepticism, as all previous attempts to find any minerals of economic value in the desert area of that region had ended in failure. The discovery was due to a railroad engineer named Stauch, and, the diamond finds having been substantiated, a small stampede for the region took place.

The diamonds occur scattered through the dune sands, and all attempts to determine their exact source have thus far been unsuccessful. In 1913 the production amounted to about 1,500,000 karats, valued at 63,018,000 marks, while the total production to the end of that year was 4,693,321 karats, valued at 151,926,000 marks. A number of companies are engaged in working the diamond-bearing sands; the early operations were by hand, but the installation later of power-driven machinery has resulted in a considerably greater saving of gem stones. HEINRICH RIES.

LACY, GEORGE. **South African exploration: Pioneer hunters, traders, and explorers of South Africa.** Ills. ("South Africa" Handbooks reprinted from *South Africa*): No. 63, 32 pp., Oct., 1911; No. 81, 28 pp., Aug., 1915; No. 82, 28 pp., Dec., 1915; No. 83, 28 pp., May, 1916. Office of *South Africa,* London. 6d each. 6 x 5.

These four small books, containing in all a little over one hundred pages, briefly describe the work of some ninety pioneers who went to South Africa in the earlier days of white enterprise, to hunt, to prospect, or to travel. Most of them, having written no books nor otherwise attracted wide public notice, are unknown to fame. The task of finding them out and showing just what they did to shape the beginnings of our knowledge of South Africa was arduous; and much credit is due to the author for his laborious and successful efforts to bring them into the light. The leading men among them, such as C. J. Andersson, Captain J. E. Alexander, W. C. Baldwin, Thomas Baines, and a few others are known, however, through their writings.

The author's good work would have been more gracefully performed if he had omitted some wholly gratuitous disparagement of a number of leaders in African exploration. He says, for example, that Livingstone "always posed as the discoverer of Lake Ngami." What words can be found in all of Livingstone's writings to justify this remark? He traveled with the aid and in the company of the wealthy English sportsman W. C. Oswell; and it was fortunate for that gentleman that his protégé had the fitness to write the first account of the Kalihari Desert and of Lake Ngami as they found them. Livingstone made known the results of his studies; but it was Oswell's expedition and it was he who received the medal of the Paris Geographical Society for the discovery of the lake. CYRUS C. ADAMS.

—— **British South Africa Co., The: Directors' report and accounts for the year ended 31st March, 1915.** 40 pp.; index. London, [1916]. [Despite the war

Rhodesia has made satisfactory economic progress during the year ended March 31, 1915. This is shown by the agricultural and ranching returns as well as in the increased mineral production, still the dominant industry. Gold, maize, hides, and skins are the chief products contributing to the increased export. The Northern Territory owes not a little of its late advancement to the development of the copper mining in the Katanga district of the southern Congo.]

Friedlander, Vera. **The storehouse of the gold of Ophir.** Map, ills. *Travel,* Vol. 27, 1916, No. 2, pp. 14-17 and 48. [Account of Great Zimbabwe and the various archeological interpretations concerning it, including its possible identity with the Ophir of the Bible.]

Louw, C. S. **A manual of the Chikaranga language, with grammar, exercises, useful conversational sentences, and vocabulary.** x and 397 pp. Philpott & Collins, Bulawayo, 1915. 12s 6d. 8 x 5½. [''Chikaranga is the language spoken by the natives of Mashonaland, Southern Rhodesia.'']

Mellor, E. T. **The East Rand.** Map, diagrs. *Trans. Geol. Soc. of South Africa,* Vol. 18, 1915, Jan.-Dec., pp. 57-71.

—— **Moçambique, Caminho de ferro de, e recursos que oferece o norte desta provincia.** *Bol. Soc. de Geogr. de Lisboa,* Vol. 33, 1915, No. 9-10, pp. 327-332.

—— **Nyasaland: Report for 1914-15.** 21 pp. *Ann. Colonial Repts. No. 883.* London, 1916.

Roberts, Noel. **The Bagananoa or Ma-Laboch: Notes on their early history, customs, and creed.** Ills. *South African Journ. of Sci.,* Vol. 12, 1916, No. 7, pp. 241-256. [''The Bagananoa are Bantus'' who ''occupy a strong position on the Blaauwberg Mountain, in the northern Transvaal, which they have held for about a century and a half.'']

Rogers, A. W. **The geology of part of Namaqualand.** Map, diagrs., ills. *Trans. Geol. Soc. of South Africa,* Vol. 18, 1915, Jan.-Dec., pp. 72-101.

Thornton, R. W. **The ostrich feather industry in South Africa.** *South African Journ. of Sci.,* Vol. 12, 1916, No. 7, pp. 272-279.

Wagner, P. A. **The geology and mineral industry of South-west Africa.** xvi and 119 pp.; maps, diagrs., ills., index. *Union of South Africa Geol. Survey Memoir No. 7.* Pretoria, 1916. [Describes the country by physical divisions: see abstract in the August *Review,* pp. 155-156.]

ASIA

Turkey in Asia, Arabia, Caucasia, Iran

Sykes, P. M. **A history of Persia.** Maps, ills., index, bibliogr. Vol. I, xxvi and 544 pp.; Vol. II, xvii and 565 pp. Macmillan and Co., Ltd., London, 1915. $15.00. 9 x 5½.

These volumes, based on a personal contact with Persia during a residence of twenty-one years and a mastery of the literature of ancient and modern Persia, are offered as a self-contained and complete history of the eastern country.

The author begins the work with three chapters on the configuration and climate of the land and follows this with as detailed an account as can be found of Persian history from the very hazy Neolithic period to the granting of a constitution in 1906. The introductory geographic description of Persia for a volume of this kind is remarkably well done. The author appears familiar alike with the early accounts of the country as issued by the Hakluyt Society or reported by its pioneer travelers and invaders and with the more recent discussions of de Morgan, Hedin, and Huntington. He is impressed, as others have been, with the apparent rapidity of the changes towards aridity which the condition of many of the provinces suggests. On the flora, fauna, and mineral wealth there are brief but illuminating paragraphs which, imbued with personal experiences, are more than catalogs. Before beginning the story of Persia's history the author introduces a chapter to show the changes in the land since the dawn of history and the result of these upon the inhabitants. The advances of the Mesopotamian Valley into the Persian Gulf, the former courses and volume of the rivers, especially the Euphrates, Tigris, Karun, and Oxus, and the mention by early writers of plants and animals now foreign to the land give a quantitative value to the description of Elam and Babylonia. In addition to all this, the book teems with illustrations of a wide variety of subjects, among them pictures of the land which give a good idea of the complexity and variety of Persia's scenery and the life conditions of its people. In these and the maps, which are particularly well executed, the volumes excel.

The main theme of the book is the historical account, and in this the geographer may find interesting and capable discussions of physical and social controls. Two chapters only are instanced: one on the struggle for the ascendancy of the Persian Gulf, which, as a strategic point in trade, has been under five European powers since Dias rounded the Cape of Good Hope in 1487; another on the art portraying the genius of Persia which is so strongly impressed in ceramics, textiles, and metal work.

Persia in recent years has been constantly before the public, and comprehensive and authoritative books dealing with the Persian point of view have not been within our reach. This void seems now to have been filled. It is strange, however, in dealing with a country which has been the seat of so much turmoil within a few years to publish in 1915 a book on the history of Persia which is no further down to date than the granting of a constitutional government by the shah Muzaffar-u-Din in 1906.

Robert M. Brown.

Casanowicz, I. M. **A colored drawing of the Medeba mosaic map of Palestine in the United States National Museum.** Map. *Proc. U. S. Natl. Museum,* Vol. 49, 1916, pp. 359-376. Smithsonian Institution, Washington.

—— **Cyprus, Salt from.** *Bull. of the Imperial Inst.,* Vol. 14, 1916, No. 1, pp. 37-41. [Suggests the possibilities of expanding the ancient local salt trade of the island.]

Hodge, R. M. **Historical geography of Bible Lands: A manual for teachers.** xxi and 53 pp.; maps. Charles Scribner's Sons, New York, 1915. 11 x 8. [Teacher's manual, with references, for a course in "geography as a factor in Bible history."]

L[aunay], L. D[e]. **Les pétroles sur le front de l'Irak.** Map. *La Nature,* No. 2227, 1916, June 3, pp. 359-360.

Roome, J. C. **Impressions of Persia and Mesopotamia.** *Asiatic Rev.,* No. 21, Vol. 7, 1916, Jan. 1, pp. 58-62.

Selwyn-Brown, Arthur. **Ancient Mesopotamia and the irrigation system that made it a fertile territory.** Map. *Scientific American Suppl.,* No. 2106, Vol. 81, May 13, p. 309.

POLAR REGIONS

Arctic

Porsild, M. P. **Studies on the material culture of the Eskimo in West Greenland.** Diagrs., ills., bibliogr. *Meddelelser om Grønland,* Vol. 51, No. 5 (=pp. 113-250). Copenhagen, 1915.

Apparently because the Eskimo's life is generally thought to be simple and primitive even the best of the current textbooks tell little more than the geographies of fifty years ago. Yet his life is not simple, and as an adaptation to environment it is still wholly untold save in memoirs like the one under review. Geographic writers should seize the wealth of available material and make it their own.

Between pages 131 and 140 is an extraordinary description of the vital intimacy between the Eskimo and his fiords and ice-fields. The exact hunting methods adopted depend upon the ice, whether old or new; the surface, whether snow-covered or glassy; the sun, whether low or high; the currents, icebergs, headlands, and the degree of cold. Certain types of boots fit one set of conditions and not another; and so it is with the rifle, bow and arrow, net, club, harpoon, kyak, and likewise the exact method of attack. In a storm, for example, the sleeping sea otter is easy prey because the new-fallen snow deadens the footsteps of the hunter. Higher grades of skill must be attained in hunting under difficult conditions, until at last the most expert may hunt in that inferno of risk and toil, the feeding grounds at the edge of the glacier ice at the fiord head where calving icebergs, open water, and tidal eddies take their steady toll of life.

A settlement has not merely a chance location nor is it made with respect to shelter alone. What is the habit of the ice, of the current, of the game? Where are the headlands? Will there be open water at the right season and near shore? What are the supplementary resources of the land? Is there driftwood? These are the persistent inquiries of a tribe in seeking a new location. There are no trees, hence the driftwood is from far distant sources. It follows that it is broken and small, and a single piece will rarely serve for a bow. Now a bow must have two qualities—rigidity and elasticity. To secure the one, pieces of wood, generally three, are bound tightly together; to secure the other, strips of walrus hide are fastened on either side. Porsild calls the result one of the greatest inventions of our (*sic*) time. They have nets of split whalebone and use them through and under the ice. A surplus of light and heat is their idea of luxury.

This is only attained when nature conspires against the game to man's benefit. Here is paradise:

"When severe cold sets in suddenly, and with calm weather, it frequently happens that a school of white whales, or narwhals, is cut off from the open water by a broad belt of ice. The whales soon become exhausted owing to the difficulty of breathing, and if they find an opening in the ice they all resort to it, and cannot leave it again. Here, from twenty to several hundred animals may be found at such an opening. If this opening is small the animals may lie closely together; the narwhals, for instance, pushing their way to the edge and placing their tusks upon the ice. In calm weather their moaning may be heard for miles around, and the steam from their breathing rises from the hole into the air, so that such a *savssat* [as such a place is called] is soon discovered. According to the hunting by-laws in force it is the joint property of the surrounding settlements, and the finder gets a reward at the public expense, and everybody may secure for himself the right of possession by thrusting a harpoon into an animal. As the animal cannot get away, the form of the harpoon is quite immaterial, and it is only necessary that a small piece of line be attached to it in order to identify it. One by one the animals are killed—formerly with lances, now usually with guns—, drawn up, and driven away on sledges, and this may be continued till the whole flock is captured, or till the weather turns and the ice is broken up, when the animals are set free."

There is also much on Eskimo migrations—a problem of growing interest; an admirable summary, pages 235-236; and a working bibliography that loses little in value because it includes only those books which the author had with him in Greenland.

Anderson, R. M. **Canadian Arctic Expedition, 1915.** *Summary Rept. Geol. Survey of Canada for 1915*, pp. 220-236. Ottawa, 1916. [See also items on "Return of the Southern Party of the Stefansson Expedition" and "Explorations in Victoria Island" in the September *Review*, pp. 232-233.]

[Chipman, K. G., and J. R. Cox. **Report of the Topographical Division], Canadian Arctic Expedition.** *Summary Rept. Geol. Survey of Canada for 1915*, pp. 244 [original incorrectly 424]-245. Ottawa, 1916. [See also items in the September *Review*, pp. 232-233.]

—— **Expéditions polaires de Sverdrup et de Vilkickij, Radiotélegrammes des.** *Bull. de l'Acad. Imp. des Sci. [de Pétrograd]*, Sér. 6, 1915, No. 7, pp. 566-584. [In Russian.]

Galitzine, B. **Rapport sur la situation actuelle des expéditions polaires de Sverdrup et de Vilkickij.** *Bull. de l'Acad. Imp. des Sci. [de Pétrograd]*, Sér. 6, 1915, No. 3, pp. 193-196. [In Russian.]

Koch, J. P. **Vorläufiger Bericht über die wichtigsten glaziologischen Beobachtungen auf der dänischen Forschungsreise quer durch Nordgrönland 1912/13.** Map, diagrs., ills. *Zeitschr. für Gletscherkunde*, Vol. 10, 1916, No. 1, pp. 1-43.

O'Neill, J. J. **Geological reports, Canadian Arctic Expedition, 1915.** *Summary Rept. Geol. Survey of Canada for 1915*, pp. 236-241. Ottawa, 1916. [See also references in note on "Return of the Southern Party of the Stefansson Expedition" in the September *Review*, p. 232.]

Rasmussen, Knud. **Den II. Thule-Ekspedition til Nord-Grønland.** Map. *Geografisk Tidskrift*, Vol. 23, 1915-16, No. 5, pp. 198-200. Copenhagen. [Detailed plans of the 1916 trip, which were summarized in the July *Review*, pp. 65-66.]

WORLD AS A WHOLE AND LARGER PARTS

Scott, W. B. **A history of land mammals in the western hemisphere.** xiv and 693 pp.; ills., index. The Macmillan Co., New York, 1913. $5. 9½ x 6½.

The author says: "The western portion of North America has preserved a marvelous series of records of the successive assemblages of animals which once dwelt in this continent; and in southernmost South America an almost equally complete record was made of the strange animals of this region." A wish to make this history intelligible led to the preparation of this book.

The work is primarily intended for the layman, yet it cannot fail to be of interest to those zoölogists who are interested in evolutionary theories. The first four chapters discuss methods of studying rocks and fossils, the classification of mammals, and the geographical development of the Americas in Cenozoic time. The geographical distribution of mammals receives very adequate treatment. Among the factors that determine the presence or absence of any species of animals, the author mentions climate, mountains, plateaus, rivers, deserts, and preoccupation by another species.

Moreover, he calls attention to the fact that the climate may have little to do with the presence or absence of any particular species. Thus many plants and animals, when artificially introduced into a new country, often multiply prodigiously, as the rabbit in Australia, the English sparrow in America, the gypsy moth in New England, etc.

A very interesting discussion of the succession of mammalian faunas in North and South America follows. The author shows that the llama, camel, and horse are really derived from a long line of ancestors which originally were native to North America but are now scattered abroad. This is surprising from a geographical point of view, although it is even more surprising to find that there were elephants and their relatives, the mastodons, living in North America. It is thought the mastodons were known to the early Indians. The elephants undoubtedly came from northern Asia by way of Alaska, where Bering Land (now the bed of Bering Sea) connected it with Asia. At least ten species of the horse roamed Mexico and the United States even into Alaska, but not the ancestor of the modern horse.

Other chapters deal with the early geological history of the horses, pig-like animals, carnivora, and the monkey-like animals. Concerning man, he says: "There can be no question that man originated in the eastern hemisphere and at a very remote period. Abundant remains of his handiwork and of himself have been found in Europe as far back as the Pleistocene, and recent discoveries in England have increased the already known length of human habitation in Europe."

A final chapter discusses the different ways in which mammalian evolution may have come about. Whether some species came into existence suddenly (as mutants) or by slow, continuous processes, is a question still unsettled and likely to remain so. The work is abundantly and well illustrated and contains a glossary and complete index.

R. W. SHARPE.

PHYSICAL GEOGRAPHY

METEOROLOGY AND CLIMATOLOGY

BIGELOW, F. H. **A meteorological treatise on the circulation and radiation in the atmospheres of the earth and of the sun.** xi and 431 pp.; diagrs., index. John Wiley & Sons, Inc., New York, 1915. $5.00. 9½ x 6.

The title used on the back of the book, "Atmospheric Circulation and Radiation," is undoubtedly the one by which it will be known to students of meteorology; but inasmuch as a large part of the volume deals with problems of the solar atmosphere, the title page, as given above, is a more exact designation.

There are certain books in every science which distinctly mark transitional periods in the development of that science. In meteorology, Ferrel's "Popular Treatise on the Winds," published in 1889, may be instanced as such a book; and we think that the present volume may be put in the same class. As with Ferrel's book, so, too, this book is the outcome of many years of professional service. It sums up the matured thought of one who has been long in official harness and who knows the weakness of much that passes as authoritative. Bigelow has been something of a pioneer in the thermodynamics of the atmosphere and, if we may borrow a figure from woodcraft, has blazed a trail and made the way easier for the rest of us. In this book the author recognizes that the atmosphere is a real atmosphere, not an ideal one, as is generally assumed in mathematical treatises. It is a non-adiabatic atmosphere, and the gas coefficient, the so-called constant R in the characteristic equation, has different values at different heights, in the free air; and there is variability in specific heat. In fact there could be no circulation and no radiation such as do exist unless the specific heat did vary.

A most laudable purpose of the author is to save labor to other workers by giving full tables of equivalent values and conversion factors with numerous examples and results conveniently tabulated. All workers in meteorology, or shall we say aërography, long for the time when a single and uniform set of units shall be used. Bigelow brings together three systems of units, or rather three series of constants in three systems of units, and gives us gravitational force values in meter-kilogram-second, centimeter-gram-second, and foot-pound-second units, then mass or values of weight in the same three sets, and finally heat values. He prefers the first of them and suggests incidentally that if the divisions on the barometer scale be made 0.75 millimeter, the scale distance becomes 100 units of force; and pressure readings become immediately available for all forms of dynamic and thermodynamic meteorology. This scale, he holds, is equally valuable for public purposes and synoptic chart construction. Bigelow also says "that it would improve matters greatly to mark barometers in terms of pressure of an atmosphere at sea-level and thermometers in degrees absolute." He makes no reference, however, to the use of the *megabar* atmosphere and the system employed at the

Blue Hill Observatory for at least two years, where the pressure is given in units of force, the level at which one million dynes is found being regarded as the base instead of sea-level. Thus a *kilobar* (one thousand bars or dynes) is the thousandth of an atmosphere and a far more convenient unit than the one proposed above. Nor do we find a reference at this point to the suggestions of Köppen, Bjerknes, and others, nor to Gold's paper on barometer readings in absolute units.

A characteristic generalization is found in equation No. 27, which shows that for unit mass the force of gravitation must be balanced by the change in pressure, the kinetic energy of circulation, and the radiating heat. While the sum of the energy of circulation and radiation can be computed through the difference of the specific heats, there is no way to separate the two except through direct observation of the velocity. In the free air, the three terms, gravitation, pressure, and circulation seldom balance, and hence equations based on adiabatic conditions do not give complete solutions of thermodynamic problems of the atmosphere. This is Bigelow's point of departure, and in our opinion marks the transition in the status of meteorology spoken of above.

One gets the impression that certain equations are used as foundations for rather lofty superstructures. There is another matter of minor importance but worth mentioning, and that is the use of the same symbol to represent entirely different quantities, and this even on the same page. Thus the all-important R does double duty as gas constant and radius of the earth. Meteorological writers from Ferrel to Bjerknes have been careless in this respect, and certain letters like g and r are as changeable as chameleons. The trouble arises from the fact that equations used in astronomy, geodesy, and physics have been carried over into meteorology.

Table 7 gives a summary of formulas and constants from the kinetic theory of gases for the atmosphere in the C. G. S. system, a much-needed table and the first of its kind; but we could wish that the value of an atmosphere had been taken as 1,000,000 dynes instead of the sea-level value of 1,013,235 dynes. Chapter II deals with working non-adiabatic equations and again emphasizes the effect of the absorption of solar radiation and the emission of atmospheric radiation in various ways. We have, as exemplified in Tables 14 and 19, practically a new thermodynamic meteorology. In Chapter III, entitled "The Hydrodynamics of the Atmosphere," there is an extended analysis of the forces of rotation and an application of the equations of motion to Ferrel's local cyclone and the German local cyclone. Isobars are centered as circles upon the vertical axis, though this is not the case in nature, as Bigelow points out, except in waterspouts, tornadoes, and hurricanes. Then follows a discussion of funnel-shaped and dumb-bell-shaped vortices in which use is made of Stokes's functions. Chapter IV, consisting of 64 pages, is to the meteorologist the most important chapter of the book, dealing as it does with the structure and construction of ocean and land cyclones and containing a clear and well-put historical review of the three leading theories of the physical causes of storms. These theories are: (1) Ferrel's warm-center and cold-center cyclones; (2) Hann's dynamic production of temperatures as found by observation; (3) Bigelow's asymmetric cyclone with warm and cold currents arranged in ridges, or streams of different densities and driven into local cyclonic and anticyclonic circulations by the force of gravitation.

Chapter V treats of radiation, ionization, and magnetic vectors in the earth's atmosphere. The theory of the pyrheliometer is given in detail, with examples of the relative steadiness of the radiation at stations having different elevations, with evidence tending to show that effective radiation at low levels is less than 2 calories; and that about 2.1 calories is reflected back to space, escaping direct observation, so that the true solar constant is really more than 4 calories per square centimeter per minute. This of course brings into question the mean value as given by Abbot of 1.93 by various observations; and the latest value obtained by balloon instruments at 22,000 meters of 1.88 calories for the date of ascent. One remark seems fair and worth remembering by all concerned in the controversy, that "at present one must be very conservative in attributing to solar radiation the entire apparent variation of the radiation measured by pyrheliometer and bolometer."

Bigelow's figure for the solar constant is 4.047 calories and for the temperature of the solar photosphere 6900° A.

Chapters VI and VII treat of thermodynamic values to the top of the atmosphere, and we have for the first time the complete story to a height of 50,000 meters. Figures 74 and 75 are significant, as is also Table 85, where thermodynamic data are extended from the 40,000-meter to the 90,000-meter level. The stratosphere, or so-called isothermal layer, from 11,000 to 38,000 meters, is defined as merely that part where the surviving solar radiation nearly balances the terrestrial radiation.

The typographical make-up of the book is excellent. ALEXANDER MCADIE.

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ALONG THE MAINE COAST*

By E. P. MORRIS

A coast is the line where land and water meet. It may, conceivably, be approached from either direction, and some excuse is to be made for those who elect to see it from the side of the land. But this is in all cases an error; a coast line should be looked at from the water.

If the coast is the coast of Maine, the error is peculiarly deplorable. For Nature arranged this shore in a dramatic mood, with a definite purpose, intending it to be properly approached and to disclose itself in a series of episodes leading up to a climax. Taken in the order intended by the artist, from the water and from the south, the long first stretch from Kittery to Portland outlines the situation and introduces the persons of the drama. From Casco Bay to Rockland, the plot is involving itself in a confusion of bays and a bewildering tangle of islands, until Owl's Head, too completely picturesque to be quite credible, both closes the introduction and introduces the great scene. The height of interest and dignity is in Penobscot Bay and the region of Mt. Desert, where islands in endless variety of size and shape and color, scattered in a kind of ordered irregularity over a broad bay and surrounded by a ring of mountains close to the sea, present, beyond comparison or question, the climax of beauty on the New England coast. Yet farther east the shore is by no means without its charm, and it runs off into a final scene of beauty under the cliffs of Grand Manan. It is clear that a coast line arranged on so elaborate a plan should be suitably approached and deliberately enjoyed, as the artist intended. To take a night train from Boston to Mt. Desert Ferry is to miss the meaning of it all, and to come to the coast at Rockland and go by steamer across Penobscot Bay to Bar Harbor is a kind of greediness, like saving all one's appetite for the dessert.

The beginning of it all should be Kittery. One who slides in past Whaleback and drops anchor in the cove has done something more than

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cross an invisible state line; he has entered into a different kind of life and will see about him the beginnings of a different civilization. Kittery Foreside heads a long list of curious and unfamiliar names, English, French, and Indian. Agamenticus, just visible to the north as a blue dome against the sky, is the first of the mountains, which, later, will come down in steep cliffs to the sea. The fishing boats at their moorings in the cove will be seen again in fifty other coves; they are an announcement of the fact that fishing, which south of the Cape survives chiefly as a sport, is here still a sober industry, by which men earn a living. On the shore a summer hotel proclaims, perhaps too loudly, the importance of a second industry of the state, which is also, in Maine, a sober business. The past speaks from the slip behind the fish-house, where the hulk of the schooner *Myra Sears* lies on her bilge with the tide flowing in and out of her hold. She was nearly a hundred years old, built to last, with main-beam a foot square, one of the fleet of sailing packets that used to ply between some village and the city of Portland, carrying the local produce to market and returning with a miscellaneous cargo of purchases for the friends and neighbors of her captain. So, two hundred years ago, the sloop *Speedwell*, Francis Brown, master, made her regular voyages from New Haven to Boston, carrying wheat and rye and furs and bringing back, on one occasion, a hogshead of rum and six yards of blue cloth for the Collegiate School, then still in its early home at Saybrook.

Kittery is the place of beginnings only, not of full disclosure, and the line of shore up to Portland merely hints at what is in reserve. Long stretches of quiet beach still repeat the south; the Nubble and Baldhead Cliff and Prout's Neck, where Winslow Homer lived and painted, are suggestions in a reticent New England fashion of the bolder beauty of the north. And Portland harbor, notwithstanding the picturesqueness of the heights that surround it, is a city harbor, fringed about with wharves and grain elevators, like the southern ports. But here, too, the difference may be noted by an observant eye; the vessels at anchor are four-masters or sea-going steamers; an occasional square-rigger lies at a wharf; and the water-boat does not come silently alongside the yacht in the morning looking for a customer, but must be summoned by the proper fisherman's signal, an empty bucket slung from the masthead.

It is to the eastward of Portland that the full disclosure comes. As one follows the winding course among the islands and turns through Chandler's Cove, he rounds a red spar and has arrived, at once and unmistakably; deep water, smooth masses of granite, and, best remembered of all, the pungent fragrance of spruce and balsam from the dense thickets that crown the little islands. Here it is that we cry out together, "The real Maine!" This is Miss Jewett's Country of the Pointed Firs, and no one who sails this coast can fail to note the aptness of her descriptive phrase. Seen from the water, they clothe the shore with their dark green from Casco Bay to

Quoddy. On shore they are at first a little disappointing. The upspringing form has much of the beauty of a slender spire; and the spread of the flat lower branches over the turf, close-cropped by the sheep, makes a natural base for the pyramid, but one misses the shelter and shade of larger trees. Here, however, is their peculiar merit, appropriate to the weather and the air. In the cool breeze that moves over the Maine coast, shade is less to be desired than shelter from the wind and warm exposure to the sun. The sheep-tracks, winding among the spruces, lead into little open glades, natural sun-parlors, carpeted with moss; when the northwest wind blows overhead, these are places to retreat to with a pipe and a friend or a book —places of peace, where rest is occupation enough.

The traveler along the Maine coast by boat will be both sailor and housekeeper, pursued by the cares and stimulated by the ambitions of the housekeeper, and he will begin early to make acquaintance with the locality and the capability of shops. In some respects nothing could be more satisfactory than the country store of Maine. If you need a half-inch shackle or thirty fathoms of twenty-one thread manila or a pair of eight-foot oars, there is no town or hamlet or wilderness where you cannot find them; the necessities of life are there. And not merely the necessities of rope and hardware; in Kittery, if you go to the right place, the boy will pull out a drawer that holds about two bushels, and count out your dozen of hot doughnuts—your dozen, do I say? your six dozen, your gross, for aught I know. And on the New England coast the pie will naturally not be lacking. Of this article of diet, it is difficult to speak without a sense of constraint, so unfortunate are the associations that have been gathered about it; it is enough to say that in Maine the blueberry pie attains a size and ripeness unknown to other climes. There is a village on the coast, to be named only to the initiate, where blueberry pies may be had of such a quality that the skipper of a visiting yacht, after eating his fair quarter, started at once for the shore to secure the maker in perpetuity and returned in sadness when he recalled the obstacles of a husband on one side and a wife on the other. But these are the necessities; for such luxuries as fresh bread or a bit of steak one must be prepared to search; he must not expect to find them ready at the end of a telephone wire. The search will sometimes be easy; in Tennant's Harbor turn once to the left and once to the right and you can get excellent milk, at the shoemaker's. Or it may be somewhat more complicated; to get fresh bread at Little River, enter the harbor early Tuesday afternoon, stop and converse with the keeper of the store on the wharf, leave an order at the ice-cream parlor, and go the next morning, Wednesday, before seven to the second white house up the road to receive your bread from the hands of the maker; and very good bread it will be. Out of a succession of such experiences will be gradually accumulated a knowledge of foraging so varied and extended that it transcends the limits of the practical and attains to some of the qualities of a philosophy of life. It

seems probable that in the end a sixth sense is acquired, by virtue of which in a strange village one takes automatically the right turn, letting the reins of his will lie loose upon the neck of his instinct, and stops unerringly before the only house in town where fresh eggs may be bought.

The word "bought" which I have just used, is correct enough, for these are business transactions taking place under some economic law of demand and supply; but in the direct contact of producer and consumer the business elements fade into the background, and the immensely more interesting human elements come forward. I am not merely a buyer, any buyer who happens to come into a shop with money in his pocket; I am the man from the yacht that anchored in the cove an hour ago. And the seller is half farmer, half lobster-man, and his two boys are standing by with eyes and ears open; and I state my needs and he modestly doubts whether he can satisfy them, but will see what he can do. There is a sense of favor asked and granted, of accommodation, in the old New England sense, rendered and accepted. Something has passed from the one to the other besides a dozen eggs and a small coin; we have been stirred to an unaccustomed freshness of perception by this contact with the unfamiliar. We have returned to something like barter.

The coast of Maine is an alternation of bays and headlands, with deep water everywhere. If one will take pains to avoid the headland and will follow the shore up the bay, he will presently find himself in that most delightful of spots, a snug harbor. For the sailor's joy is not wholly in sailing, perhaps not chiefly in sailing. That is a means of getting from one place to another, agreeable in good weather, exciting sometimes, sometimes monotonous, at all times a normal and ordinary kind of business like any other. It is the poet, not the sailor, who shouts for "a wet sheet and a flowing sea." The aspiration of the real sailor is expressed in humbler terms: "a snug harbor, both anchors down, and all hands drunk but the cap'n." This is an aspiration which, if we pass over some details as unessential—and possibly, when we think of the captain, a little selfish,—may be realized in a hundred spots in Maine. Go up John's Bay past John's Island—paying no attention to the maker of the chart, who wages unceasing war upon the possessive case and would have you call it John Island—past John's Island and the steamboat wharf, turn in to the northward far enough to be out of the tide, let go your anchor—one should suffice—and look about you. The sea, for all its delights, is an open place; nowhere is one more completely out of doors. Here, in the snug harbor, there is by contrast all the sense of shelter which the walls of a quiet room give. Especially if it has been blowing a little too strong outside, the feeling that the day's work is done and the time for relaxation—and dinner—has come, makes a home out of even a strange harbor. The hill rises steep to the north, cleared into sheep pastures; half way up the slope is the comfortable farmhouse; the wharf is old and gray, sagging a little in the

middle; time has taken it out of the things that men have made and turned it into a natural object, like the rocks from which it projects; below the high-water mark its piles are thickly covered with mussels, which from a distance give them a texture like purple velvet; the summer cottage, inevitable feature of every harbor, is quiet in color and the voices that come from it across the water are pleasantly modulated and seem to promise that no singing machine shall disturb the serenity of the evening. To the eastward is the broad and peaceful level of the river, spreading over the shoals, and the tide sweeps strongly past the mouth of the cove, with flecks of brownish-white foam that show its speed and with dimpling whirls to prove its strength; and your boat lies dead quiet, the anchor chain hanging straight down from the bow.

Or, if you have spent an uneasy and uninteresting night in Rockland harbor, wakened in the early morning by the whistle and wash of the Boston boat and stifled by the fumes of the lime kilns, then follow along the western side of the island of North Haven and look for Pulpit Harbor. It will need looking for; it will be seen two or three times before the unmistakable Pulpit Rock appears and the narrow entrance opens out. Until midsummer there will be a brood of young hawks on the flat top, where the Bible should lie; the parent birds will start up with threatening cries and their young will scream in protest against being abandoned. Turn sharply around the Rock; keep clear of the shoal on the eastern side, and choose your anchorage with a painter's eye for the making of pictures. It is not well to be too easily satisfied, for there is one perfect spot, and only one. The sharp tip of the church spire should show over the crest of the hill to the southward; to the westward an inner cove is dark to the water's edge with spruces; on the other side, the road leading to the three or four houses crosses the head of the harbor on a curious stone bridge, each pier a pillar of granite, a monolith roughly squared as it was blasted out in the quarry. To the northwest—and this is the peculiar merit of this one anchorage—the Pulpit Rock will stand out, apparently in the middle of the entrance, against the purple background of the Camden Hills, repeating in little, with a singular fidelity, the characteristic outline of the greater mass across the bay. It should be "coffee on deck tonight," until the sun sets in splendor behind the hills and all the ways are darkened.

It may be fancy, but there seems to be a special sense of security in an island harbor. Safely land-locked in Burnt Coat or Isle au Haut, one is perhaps conscious that his peace is only temporary and that tomorrow he must be under way again. Or it may be the remoteness, the loneliness of an island harbor. Beyond the eastern end of Moosabec Reach is a tiny cove perfectly enclosed and sheltered by three high islands. One must work in carefully, with a constant eye upon the chart, and must ride to a short chain. The islands are not cleared, and no house or sign of habitation can be seen. It is primeval loneliness and quiet, and perfect safety. A fisher-

man's sloop may lie at her mooring at the head of the cove, with the faint smoke of the evening meal rising above the cuddy into the still air, but the fisherman, if he puts his head out of the hatch when your anchor chain rattles out, goes back again to finish his supper, and his indifferent seclusion emphasizes the solitude. Here at night you will hear the cry of the blue heron, shyest of birds, and be wakened by the fierce snarling of fighting seals.

The summer breeze along our coast is likely to drop at sunset, and memories of harbors are most frequently associated with quiet evenings and nights of calm. But there are other memories not less cherished, which recall excitements and the sense of escape. Not that the cruising yachtsman is often in real danger. Gales in summer are not heavy and in this, as in some other respects, the cruiser is only "playin' at sailorin'," as a real sailor once remarked. But there will be occasionally enough of squall or of heavy weather to enable the play-sailor to maintain the illusion and to enjoy, as he struggles into harbor, something of the sensation of escape from danger. The island and lighthouse of Petit Manan are picturesque at all times, and Dyer's Bay is an ample harbor with a soft curve of shore, but both may be transformed by a change of weather. Let the thunderheads pile up along the land and be torn here and there into ribbons; let there be an hour of doubt whether the squall will reach off the land, followed at last by a swift whirl of wind and rain from the northeast that blots out the landmarks and picks up the water into bright green, sharp-cut waves topped with white. Suppose, too, that the harbor is strange to you, that a hasty look at the chart shows only one buoy on the eastern side and an unmarked shoal running out from the other shore, and that the boat is staggering, overborne by the wind. This is not danger, not danger to life, but when at last you run behind a sheltering point, when the anchor has a good hold of the bottom, when the sails are furled and sheets and halyards coiled down, when the cabin lamp is lighted and the chowder is on the table, the sense of escape and security will be real, though the danger was not, and the memory of wind in the rigging and rain driving down on the deck will be not less pleasant than the memory of moonlight and calm.

I have been using the names of places as they happened to come up, but the names of the coast are peculiar enough to claim a word for themselves. The monotony of our names of towns has often been lamented; a leaden propriety has given us Johnstown, Thomaston, Williamsburg. But the coast abounds in natural objects; and in the naming of these, happy accident and lively fancy and tradition and humor have had a freer play. Maine was settled by Englishmen, who have given us Biddeford Pool and Kittery Foreside, Merchant's Row and the two Thorofares and the two Reaches. It was also visited by Frenchmen from the north; Grand and Petit Manan and Mt. Desert and Isle au Haut preserve their tradition, slightly corrupted by the fishermen into *Tit Manan* and *Aisle o' Holt*. The

Virgin's Breasts are two smooth and rounded little islands in Moosabec Reach; the name must have been given to them by a Catholic Frenchman and then translated into English. The two tides of immigration may be supposed to have met in the neighborhood of Mt. Desert, where Frenchman's Bay was certainly named by an Englishman who found a Frenchman already settled in that choice spot. The Georges Islands commemorate an early explorer, who has left on record his expectation that the river, which also bears his name, would be the location of a great trading port. Blue Hill Bay was evidently the bay from which the blue hill to the northward could be seen; as the settlements extended back from the shore, the name went with them and was attached to the mountain in spite of its green slopes. A lively fancy named the Fox's Ears, two reddish-brown rocks at the entrance to Fox Island Thorofare, and Junk o' Pork, which seems to lie rectangular on the surface of Casco Bay as on a table. Of the tragedies of the sea, such as named Cerberus Shoal from a vessel lost there, the Maine coast has preserved no memory. Mistake Harbor was not necessarily fatal, and the tragedy of Burnt Coat Harbor must have been restricted to the owner of the garment. An inhabitant of this place, from whom information was sought, seemed to regard it as an ordinary and uninteresting designation; "hadn't never thought of it before," he said. Comedy, however, must surely have been in the air when Jones's Garden was named; it is a mass of solid granite with a few inches of soil supporting a dozen wisps of coarse grass on the top. The original Jones has faded out of the tradition of the neighboring village and has carried away with him whatever personal traits led his townsmen to immortalize him; his garden remains, a starting-point of humorous speculation to the crews of passing vessels.

A few men along the coast keep stores; the rest are farmers or fishermen or boat-builders. On a Gloucester fishing schooner, the word farmer is a term of deep contempt; not so in Maine, where every farmer has a boat of his own and is a fisherman and boat-builder himself. We men of the cities bring with us into the country certain obvious superiorities, in dress, money, habits of speech, which stand in the way of easy intercourse. The best solvent of such stiffness is a common interest, and it is here that the sailor, even the play-sailor, has his immense advantage over the summer boarder. For the problems and needs of sailing are immediate and lively, and they do not wait for introductions. When you are rounding up to anchor, you are thinking of the holding-ground and the depth of water, and it makes no difference whether the man to whom you shout your question is rich man, poor man, beggar man, or even thief, if only he can give you the desired information, at once and accurately. Questions of social status and a college education take their proper place, in the rear. The weather, last refuge of the striving conversationalist ashore, is here a matter of genuine concern; it conditions the future at sea. When the fisherman whom you

pass as he is under-running his trawl, waves a hand and calls out, "Fine breeze," he really means it, and is thinking how much better it is to run home before a fair wind than to row a heavy dory. On the water, compliments sound genuine and gifts are freely offered and accepted. "Nice little ship you've got there; go anywhere in her," says the fisherman returning from the weir. I accept the expression of approval and the fresh mackerel that he tosses over the rail, as simply, I hope, as the small boy, perched in the bow of his father's dory, accepts a peach from me. "I d'know as he ever et a peach before," says the smiling father, and we are all friends together and exchange calls at night in harbor.

I would not seem to imply a condition so idyllic that all intercourse is an exchange of gifts. You will pay for most of your fish and all your peaches, and the boat-builder who mends your leaking skylight will charge a price—a reasonable price—for his services. Probably, too, he will keep you waiting for it, waiting till he finishes that job on the coaming of Bill Porter's boat that he promised to have done this noon and hasn't got through with because he had to stop to do a bit of caulking for Harry who was in a hurry to get off to his trawl. Half the village is involved in the sequence of jobs and wishes. Here is the test of the man from town. If he has acquired the beginnings of wisdom and is looking for experience in the journey of life, he will gladly, not impatiently, find himself drawn into this tangle of jobs, even though it be in the last place, and will sit down by the work bench in the fashion of the village, to listen and to talk.

It used to be said that the talk of a Yankee was chiefly inquisitive; I should say that it was mainly narrative, disclosing with a conscious purpose the experiences of a fisherman's life, the humor and the seriousness of it, stories of danger or of rescue. You may hear, perhaps from one of the actors in the story, how a vessel came ashore in a gale and snowstorm, and some women ran to the nearest house for help. One of the men, a chronic sufferer from rheumatism, at first refused to go out into the storm, but his father dressed and took his lantern and began to struggle down to the point against the gale. As he came near the shore, he saw a second lantern; it was the son, who, like another son in Scripture, "afterward repented and went." And the two pushed on until they heard, over the roar of wind and sea, the sharp snap of slatting canvas, and, stooping low, they saw against the black sky the blacker smudge of a schooner's mainsail. The vessel lay near shore, but no power could cast a line against the wind, and, with the intelligent self-control of those who spend half their lives waiting for the changes of natural forces, they sat down in the lee of a rock to wait for daylight Then, suddenly, the coils of a line fell across the spot of light, the deep-sea lead-line thrown with the wind from the vessel, and, one standing on the bank and one in the break of the seas, they pulled three men ashore. Meanwhile, on the outer side of the same point, where the sea breaks heavily on the quietest day, the other schooner which they had

been summoned to help was grinding to pieces, and twelve of her crew were lost.

Here and there along the coast, one finds evidence of the pitiful degeneracy that comes in part from isolation. In the harbor of Horse Island, two boys came out from shore in a rude boat. One, the older, had the striking beauty of color and features which we associate with the southern races. He wore nothing but a tattered pair of trousers and the waist of a woman's dress, too thin for the sharp air, open down the front and with one sleeve torn half-way to the shoulder. With the alert look of a wild creature he rowed slowly round and round the yacht, silent, curious, unsmiling, not responding to offers of fruit, staring with his dark eyes. He came from a small settlement on the mainland, where Indians and negroes and lawless whites have maintained a spot of isolated barbarism within twenty miles of Bowdoin College.

In general, the Maine village is a self-respecting community, still preserving its town-meeting and printing its frank record of receipts and expenses for every voter's free criticism. Here is local self-government at its best. The intimate knowledge of the work to be done, of the price of labor, and of the personal character of everybody concerned, stimulated, as it is, by a combination of public and individual interest, makes the town-meeting a training school in citizenship and in social organization. Into the harbor of such a village, there came a few years ago a school of the small whales called "blackfish." Instantly, the town was in boats. The natural leaders took charge, the others took by instinct their proper places. Each man understood the plan without orders and obeyed orders because he understood. A line of boats stretched across the mouth of the harbor filled with boys who had appointed themselves to the congenial duty of keeping the fish back by shouting and splashing. Another line, with older men in the boats, drove the school to the shallow head of the harbor, and the whole town united to keep them there till the tide fell and they could be killed. Then the oil was tried out and sold, and a committee, in the presence and under the critical eyes of the whole town, paid to each man and boy his due share.

This is the social efficiency which comes from the self-directed efficiency of the individual. The city must face and is, in fact, facing the difficult problem of retaining the spirit of the town-meeting under conditions which make the old forms of self-government impossible. Along the Maine coast, the old forms are still in use and still effective.

THE DECREASE OF POPULATION ALONG THE MAINE COAST

By LEONARD O. PACKARD

Practically all the cities and towns of the Maine coast counties are losing rapidly in population. A study of the census reports shows a rapid increase in the population of the state as a whole between 1800 and 1850. From 1850 to 1860 there was a much smaller increase, and the following decade, 1860 to 1870, shows an actual loss of .2 per cent against an increase of 22 per cent for the whole country. From that time to the present the

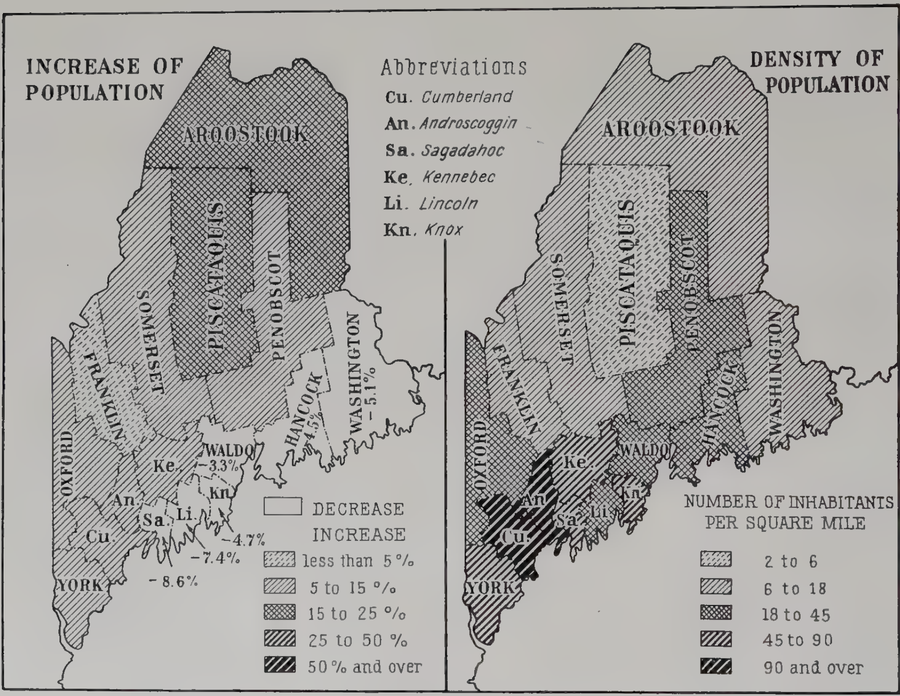

Fig. 1—Maps showing the population increase from 1900 to 1910 and the population density in 1910 of Maine by counties, based on the Thirteenth Census of the United States (Vol. 2, p. 800, Bureau of the Census, Washington, 1913). Scale, 1:6,100,000.

increase has varied from one-third to one-twelfth that of the rate for the whole country. Even this low rate of increase is due chiefly to the growth of manufacturing cities, in which the increase has more than balanced the loss in the coast and rural districts. In spite of the increase for the state as a whole, the coast counties, with the exception of Cumberland and York, which include Portland and a number of manufacturing cities, show a steady decline in population (see Figs. 1 and 2).

The distribution of the population of almost any region offers an excellent geographical problem—comparatively simple when limited to the conditions existing at any one time, more complex when an attempt is made to explain differences in distribution at different times. In explaining the distribution of population it is necessary to take into consideration the character and distribution of the natural resources which underlie the industries of the region. It is quite as necessary, however, to study the character of the response made to these resources.

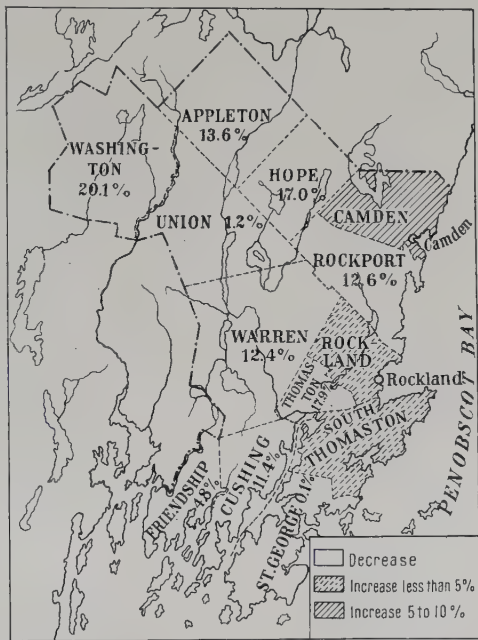

Fig. 2—Map showing decrease of population from 1900 to 1910 of mainland portion of Knox County, Maine, by cities and towns. Scale, 1:630,000.

To explain a loss in population one would expect to find either an exhaustion of natural resources or else a change in man's needs which would render these resources less useful. In the case of the Maine coast the change in population has been due in small measure to the exhaustion of natural resources. It is due in a much greater degree to changes in character of response which have made it increasingly difficult for this region to compete successfully with other parts of the country.

The industries responsible for the growth of settlements along the Maine coast were shipbuilding, the carrying trade, fishing, quarrying, lumbering, and farming. The many good harbors and the abundance of timber in the immediate hinterland, together with the great demand for sailing vessels, caused shipbuilding to develop to a remarkable degree. At one time Bath was the leading shipbuilding city of the country and Thomaston was second in importance. This industry reached its greatest development between 1845 and 1880. Moreover, many of the vessels were owned and manned by the men of the shipbuilding towns and cities. The income received by the owners, added to the wages of the crews, furnished means of support to many people. In the early days lumbering was an important industry along the coast. The forests supplied an abundance of lumber for the many vessels built. Large quantities were also sent to other states and even to Europe. Fishing, too, was an important occupation. Small fishing vessels were sent out from towns all along the coast, many of the vessels going as far as the Grand Banks. Almost coincident with the

FIG. 3—A typical fishing village of the Maine coast. Such villages have suffered through the development of rapid transportation and cold storage.

settlement of Knox County was the development of the granite and limestone quarries. These industries gave employment to many workmen and yielded large returns to the owners. A good soil, particularly on the coastal plain, where the surface as well as the soil is more favorable than on the rugged and rocky oldland, makes it possible for farming to be carried on with some degree of success.

All of the occupations mentioned have contributed in greater or less degree toward the growth of the cities and towns of the coastal region. It would be natural, then, in attempting to account for the loss in the population of the region to examine the changing conditions of the industries which made the development of the region possible.

Probably the changes arising in the shipbuilding industry more than any other one factor account for the decline of the Maine coast population. With the changes in construction from wood to steel and from sail to steam Maine lost much of her former advantage. The Maine plants were relatively far from the coal and iron necessary both for the construction of the vessel itself and also for the machinery needed for propelling it. Again, with the advent of steel, vessels were much larger, and the capital needed for maintaining a manufacturing plant much greater. This condition, together with the fact that the numerous harbors along the coast had led to the development of many comparatively small industries, made it all the more difficult for the companies to adapt themselves to the new conditions. Only one city, Bath, which had conducted the business on the largest scale, has undertaken the manufacture of steel vessels. Had nature been less lavish in her supply of harbors and thus compelled the manufacturers to concentrate the thriving but scattered industry of former years in two or three places, it is possible that the few centers with larger plants and greater capital would have been able to undertake successfully the building of large steel vessels. There must also be recognized the greatly lessened demand for vessels on account of the passing of the carrying trade from American vessels to those of foreign countries. The extent of this transfer is better appreciated when it is realized that in 1826 American vessels carried 92.5 per cent of the foreign commerce of the United States, while in 1900 American vessels carried but 9.3 per cent of this commerce. In the same time the proportion of our foreign commerce carried by foreign vessels increased from 7.5 per cent in 1826 to 90.7 per cent in 1900. The causes of this transfer, though far-reaching in their effects, are hardly geographic, except as they help us to understand the failure to respond at the present time to facilities for shipbuilding.

Fishing is another industry the evolution of which is partially responsible for the loss in population. During the first half of the last century, or perhaps up to 1860, the fishing industry offered employment to a greater number of Maine people than it has since that time. One reason for this is an apparent falling off in the number of fish near shore. Another and

doubtless much more important reason is the change in location of centers of distribution due to improved facilities for transporting fish. In the earlier days, before the great development of railroads and when refrigeration was but little used, it was necessary to preserve the fish before they could be distributed. Therefore it was customary to take them to places convenient to the fishing grounds where the work of drying, salting, etc., could be carried on. This process being completed, the fish could be shipped to market as needed or as opportunity offered. Thus fishing villages arose all along the coast. With the growth of railroad lines and the use of ice on vessels, in storehouses, and on cars, the market for fresh fish greatly increased. At the present time fresh fish are sent from Boston to Denver and occasionally to the Pacific Coast. With the development of the fresh fish industry a vessel delivers its catch to the great centers of distribution, such as Portland and Boston, from which the fish can be sent immediately to its place of destination. The effect upon the small fishing village is easily inferred. Loss of employment at the wharves and fish houses led to emigration to other places in search of work. Places along the coast, which formerly sent out many vessels, today have not a single vessel; and practically all the others are carrying on the business with a much smaller supply of men and ships. Indeed the local market men, as a rule, receive their weekly supply of fresh fish from Boston. Thus distance from centers of dense population, and less favorable means of access to such centers, account in large measure for the decrease in population through loss of opportunity for employment.

We have already suggested that the supply of lumber formerly gave occupation to many people of the coast counties. Not only was the supply abundant for all local building purposes, for staves, and for use in the lime kilns, but lumber was sent to the Atlantic Coast, to the West Indies, and even to Europe. Now the supply of the coast counties is practically exhausted. Lumber for local building purposes is obtained in small part from more northerly portions of the state. The rest comes from other parts of the United States and Canada. There is little doubt that the proximity of the forest lands to the coast and the shipyards led to a much more rapid exhaustion of the supply than would otherwise have been the case. Moreover, the nearness of the Maine coast to the shores of other Atlantic states greatly encouraged exportation of lumber, especially in days when water transportation was almost the only means of transferring bulky commodities. These early demands so depleted the supply that there is little left to aid in supporting a coast population.

Quarrying is another industry which is much less important than in former years. The granite industry became of great importance not only because of the quality of the stone, but because of the location of the material at the water's edge. The quarries possessed great advantages over inland quarries in supplying building material and paving-stones to cities

FIG. 4.

FIG. 5.

FIG. 4—A shipyard in Thomaston, Maine, showing the activity of former years.

FIG. 5—A shipyard in Thomaston, Maine, as it appears today. The wharves have gone to decay and the yard is covered with grass. As a result of conditions growing out of the present European war, the keel for a new vessel is now being laid.

on or near the Atlantic coast. Here, again, the development of railroads has worked to the disadvantage of the local industry. With the growth of railroad lines new quarries have been opened and have come into successful competition with the Maine coast. With the westward movement of the centers of population and the consequent growth of inland cities the quarries of the coast are clearly at a disadvantage as compared with those located farther inland.

A still more destructive influence has exerted itself in recent years. The use of concrete for bridges and for building construction has materially diminished the use of granite for these purposes. The use of granite in bridges, retaining walls, and dams gave an opportunity to use the surface rock or rubble and thus make possible the cheaper production of the better stone for building purposes. Not only has concrete taken the place of granite in the construction of entire buildings, but, where buildings are largely made of material other than granite, concrete has taken the place of granite for foundations and trimmings. Formerly, when buildings were constructed of granite it was necessary to make the walls of the lower stories of blocks of stone sufficiently large to sustain the weight of the upper stories. The modern granite building has a skeleton of steel which is the supporting structure. Consequently the granite wall of today is little more than a facing which serves as ornamentation for the outer walls of the building. Thus, through competition of inland quarries, which have become more accessible as a result of the building of railroads and the westward movement of population, and through the evolution of modern concrete and steel construction, the granite industry of the coast is but a vestige of what it was in earlier years.

The limestone industry has had a somewhat similar history, although the effect has been much less marked. As in the case of granite, railroads have brought other limestone quarries into competition. Besides, the westward movement of population has given inland quarries great advantage because of their nearness to market. The market for the Maine coast lime is limited almost wholly to the cities of the north Atlantic coast. Another inroad into the Maine industry in general with all other lime industries is the substitution of cement mortar for lime mortar. Cement mortar consists of perhaps 90 per cent cement and 10 per cent lime. Had it not been possible to find new uses for lime, undoubtedly the lime industry would have suffered as much as the granite industry.

None of the influences affecting the other industries are directly responsible for loss in the farming population, unless it be competition with places having better railroad facilities. But that farming has been affected there can be little doubt. The cause may perhaps be best described by the word sympathetic. In times when fishing, shipbuilding, and quarrying were prospering many farmers were able to add to the income of the farm by a few weeks or months of labor as ship-carpenters, fishermen, or quarrymen.

Now, little opportunity for outside labor is offered. Hence, the small or unproductive farm must be abandoned or sold to summer visitors, resulting in either case in a loss of population.

Taking into consideration all the industries, the factor which has had most to do with their decline is the change in the character of the response which man makes to natural resources in carrying on the several industries. Shipbuilding now requires iron and coal instead of lumber; building and bridgework use concrete and steel almost entirely instead of granite and lime; fishing requires rapid transportation rather than space for curing. Perhaps the next most important factor is the partial loss of the great advantage offered by water transportation. Water transportation limits the trade to the coastal region of the Atlantic States. With the development of railroads Maine was at a great disadvantage: first, because it does not lie in the line of a great trade route as do Massachusetts and New York; and, second, because it is farther removed from the centers of population than are those states. Exhaustion of natural resources has played small part in the loss in population. As has been shown, this exhaustion applies particularly to the lumber of the coast and possibly to the fish, although of the latter we cannot be certain.

At the present time there is little promise of the revival of a single industry mentioned. About the only places in the entire state which show gains in population are those which have water power sufficient to carry on manufacturing. It would seem, then, that the future growth of the state as a whole lies in the possible development of its water power and the resulting cultivation of farm lands to supply food to the manufacturing population.

THE CONTRIBUTIONS OF GEODESY TO GEOGRAPHY

By WILLIAM BOWIE
Chief, Division of Geodesy, U. S. Coast and Geodetic Survey

The determination of the shape and size of the earth and the location of places on its surface, referred to selected fundamental planes, are the geodesist's principal contributions to geography.

The earliest geographers must have found it very difficult to carry on their operations, owing to lack of knowledge of the shape and size of the earth and of the true relative positions of the areas under investigation.

A very good value for the size of the earth was obtained from the measurement by triangulation of a meridional arc of about 8½ degrees extending north and south of Paris by Domenico and Jacques Cassini between the years 1683 and 1716.[1] But the fact that the earth's mean figure is an oblate spheroid was only discovered as a result of the observations made in Peru and in Lapland. This work was begun in 1735.[2]

The first near approach to the actual figure of the earth resulted from triangulation done in the last decades of the eighteenth century to connect the observatories of Paris and Greenwich and to determine the length of the earth's meridian quadrant. For the latter purpose an arc of the meridian of nearly ten degrees was measured in France. One ten-millionth of the resulting length was adopted as the standard of length (the meter). Any other length could have been selected, as the standard for the meter bears no such exact relation to a quadrant, as later and more accurate data show.[3]

Geodesists were very active during the nineteenth century, and will be for some time to come, in making geodetic measurements to determine the mean figure of the earth with greater and greater precision. There comes a time, for any given area, when it is useless to add more geodetic data for the purpose of obtaining a more nearly exact mean figure, for there are constant or systematic errors present in the data the effect of which is probably much greater than that of the accidental errors.

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[1] These operations are described by the younger Cassini, Jacques, in the *Mémoires de l'Académie Royale des Sciences*, "De la grandeur de la terre et de sa figure," Paris, 1718, and in another work, "Traité de la grandeur et de la figure de la terre," Paris, 1720, and Amsterdam, 1723.

[2] Pierre-Louis-Moreau de Maupertuis: La figure de la terre déterminée par Messieurs de l'Académie Royale des Sciences qui ont mesuré le degré du méridien au cercle polaire, *Mémoires de l'Académie Royale des Sciences*, Paris, 1737. Pierre Bouguer: La figure de la terre déterminée par les observations de Messieurs Bouguer et de la Condamine de l'Académie Royale des Sciences, envoyés par ordre du Roy au Pérou, pour observer aux environs de l'Equateur, Paris, 1749. Charles Marie de la Condamine: Mesure des trois premier degrés du meridiên dans l'hémisphère austral tirée des observations de Mrs. de l'Académie Royale des Sciences, envoyés par le Roi sous l'Equateur, Paris, 1751.

[3] Modern measures give the length of a quadrant of a meridian greater by about 2,000 meters than the intended 10,000,000 meters.

But there is much to be gained by extending geodetic surveys to new areas and especially to new continents. (By geodetic survey is meant, here, triangulation and observations at connected astronomic stations.) Nearly all of the values of the earth's figures now available are the result of geodetic measurements in the northern hemisphere, and the measurements in that hemisphere, from which the earth's figure has been derived, have been confined to India, Europe, and the United States. We may hope to get, before long, values for the figure of the earth from geodetic operations in South America, Africa, and Australia. It is expected that the mean figures resulting from accurate and extensive geodetic data in those continents will agree closely with the figures obtained from continents in the northern hemisphere. The geodetic surveys of the several nations on each continent should be connected and the reductions made on one spheroid and referred to a single initial position for each continent. Should this be done we shall be able eventually to compute a mean figure of the earth which will be of such great precision that it will satisfy the most exacting demands of science.

The Geoid

Coincident with the extension of geodetic surveys there will be carried on the computation of the geoid. The surface of the geoid is probably so complex in shape that the work necessary to define it will have to be continued long after the satisfactory spheroid has been determined.

The geoid may be defined as that surface which coincides with the surface of the sea at rest. We can imagine an extension into the continents of an intricate network of sea-level canals. Then the surface of the oceans and of the water in the canals would define the surface of the geoid. At some points, probably not exactly at the sea shore, the mean surface of the earth—the spheroid—would intersect the actual sea surface, the geoid. Under the coastal plains the geoid would be slightly above the spheroid, while under great mountain ranges the geoid would be far above the spheroid, possibly as much as one hundred meters. Over the oceans the geoid would be under the spheroid surface by amounts depending upon the depths of the water.

There is only one way to determine accurately the size of the earth, and that is by measurement on the continents of the lengths of arcs connecting points where the astronomic latitude and longitude have been determined. The measurements of such arcs may be direct, or they may be by means of triangulation. The earliest measurements were by the former method, but, with the introduction of accurately graduated circles and the application of wires in the eyepieces of telescopes, the indirect method came into general use.

At frequent intervals, in triangulation, the sides of some of the triangles in the scheme are accurately measured, in order to control the lengths. At the present time, this is done almost exclusively with nickel-steel (invar)

FIG. 1—Triangulation reconnaissance signal of the U. S. Coast and Geodetic Survey, used in the selection of stations.

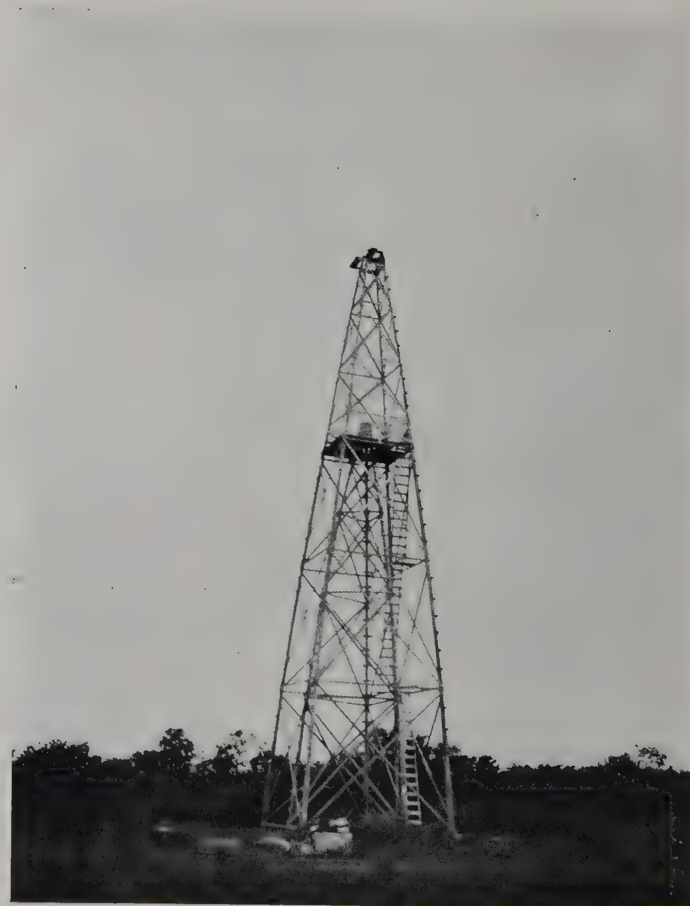

FIG. 2—Triangulation observing tower of the U. S. Coast and Geodetic Survey, used to raise the theodolite above obstructions.

tapes or wires. The probable accidental error of a measured length is seldom greater than about 1 in 1,000,000. The constant error in such a measurement may be as great as 1 in 300,000. This accuracy is, however, far greater than that of the lengths of the triangle sides, as computed through the chain of triangles. The uncertainty of any one line between bases is about 1 in 100,000, on an average. A long arc, say one across a continent, can be measured with greater accuracy than that, for even the systematic and constant errors of the various sections of the arc would probably act as accidental errors and the greater portion of their effect would be eliminated.

The observations for latitude, longitude, and azimuth, or direction, are made on the stars; and in the most refined work a correction is made for the variation of the pole.

One might think that the determination of the figure and size of the earth is a very simple process, consisting merely of obtaining by accurate observations the accurate astronomic latitudes of several points on a meridian and then measuring accurately the linear distances between them. Three such points being sufficient to obtain the equation of the ellipse formed by the intersection of the meridional plane and the spheroid, the shape and size of the earth would be known. This would be true if the spheroid and the geoid coincided throughout, but, as stated above, they do not do so. The plumb line, to which all astronomic observations are referred, is, at each point, normal to the geoid, which is a very irregular surface, and, therefore, very many astronomic stations must be established and used. The greater part of each of the differences between the observed astronomic position and the position referred to an adopted smooth mean surface, must be treated as an accidental error in the computation of the figure of the earth. These differences, called deflections of the vertical, also station errors, reach a maximum value of about twenty-five seconds of arc (within the area of the United States), which is nearly one half mile. In the island of Porto Rico, the relative deflection between two astronomic stations, one at Ponce and the other at San Juan, was 56 seconds of arc, or about one mile.

The shape, but not the size, of the earth may be determined from the observed value of gravity at stations widely distributed in latitude. But here again a few stations are not sufficient, for the change in the value of gravity with the latitude and with the elevation above sea level does not exactly follow any regular law, owing to the disturbing influences of masses above sea level and the deficiency of mass in the oceans.

It is evident that the difference between the theoretical and the observed values of gravity and the deflections of the plumb line (which, as stated above, are the differences between the observed and the theoretical astronomic positions) are due to the disturbing influences of the topography and the effect of deviations from the normal densities in the earth's crust.

FIG. 3.

FIG. 4.

FIG. 3—The *Explorer*, a vessel of the U. S. Coast and Geodetic Survey, used along the Pacific coast and the coast of Alaska.

FIG. 4—Triangulation station of the U. S. Coast and Geodetic Survey on a rocky island in Prince William Sound, Alaska.

FIG. 5.

FIG. 6.

FIG. 5—Triangulation station of the International Boundary Commissions at the northern extremity of the boundary between Alaska and Canada. The Arctic Ocean in the background.

FIG. 6—Heliographer at work on a triangulation station of the U. S. Coast and Geodetic Survey, Cuyamaca Mountain, southern California. This heliograph was observed from station American, distant 108 miles. (Photo by J. Smeaton Chase.)

FIG. 7—Structure at La Push triangulation station, near the coast of Washington, made from three standing trees, for use in elevating the theodolite and triangulation observer above the surrounding timber. The instrument support is 187 feet above the ground.

FIG. 8—Instrument support and observing platform at triangulation station Hoh, near the coast of Washington, made by throwing three trees together. Height above ground, 119 feet.

The term "topography" is applied to the visible land masses and the deficiency of mass in the oceans. But, even when the attractions of the topography are applied as corrections, the differences, which may still be large, would be generally of the opposite sign.

Isostasy

About sixty years ago, Archdeacon Pratt of Calcutta arrived at the conclusion, from a study of the deflections in India, that there must be a deficiency of mass under the Himalaya Mountains and that the deficiency extended to a limited depth.[4] The announcement of this theory marked an epoch in geodesy. From time to time, writers in different countries have elaborated on the mere statement of Pratt.[5] But it was Hayford who gave this theory a quantitative expression when, as a member of the U. S. Coast and Geodetic Survey, he corrected the astronomic latitudes, longitudes, and azimuths in the United States for the effect of topography and its negative equivalent, called "isostatic compensation," when making two determinations of the figure of the earth.[6]

Several reports by the Coast and Geodetic Survey give the results of investigations based upon the subject of isostasy,[7] and a number of other articles have appeared in recent years, notably those by Dutton, Helmert, Barrell, Becker, Hecker, and Gilbert.[8]

If the earth were composed of homogeneous material, or if at all points at any given depth the density were the same, the earth's surface, due to its own rotation and the force of gravitation, would be very nearly a true

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[4] John Henry Pratt: On the Deflection of the Plumb-line in India, caused by the attraction of the Himalaya Mountains and of the elevated regions beyond; and its modification by the compensating effect of a deficiency of matter below the mountain mass; also, On the Influence of the Ocean on the Plumb-line in India, *Philos. Trans.*, Vol. 149, 1859, London.

[5] A. R. Clarke: Geodesy, pp. 96 and 350. H. A. Faye: Sur la réduction des observations du pendule au niveau de la mer, *Comptes-Rendus de l'Acad. des Sci.*, Vol. 90, 1880, Paris.

[6] J. F. Hayford: The Figure of the Earth and Isostasy from Measurements in the United States, U. S. Coast and Geodetic Survey, Washington, 1909; *idem:* Supplementary Investigation in 1909 of the Figure of the Earth and Isostasy, U. S. Coast and Geodetic Survey, 1910.

[7] In addition to the two mentioned in the preceding footnote: O. H. Tittmann and J. F. Hayford: Geodetic Operations in the United States, 1903-06, U. S. Coast and Geodetic Survey, 1906; J. F. Hayford and William Bowie: The Effect of Topography and Isostatic Compensation upon the Intensity of Gravity, *U. S. Coast and Geodetic Surv. Special Publ. No. 10*, 1912; William Bowie: Effect of Topography and Isostatic Compensation upon the Intensity of Gravity (Second Paper), *U. S. Coast and Geodetic Surv. Special Publ. No. 12*, 1912.

[8] C. E. Dutton: On Some of the Greater Problems of Physical Geology, *Bull. Philos. Soc. of Washington*, Vol. 11, 1888-91, pp. 51-64.

R. F. Helmert: Die Schwerkraft und die Massenverteilungen der Erde, in "Encyclopädie der Mathematischen Wissenschaften," Band VI, 1 B, Heft 2, Leipzig; Unvollkommenheiten im Gleichgewichtszustande der Erdkruste, *Sitzungsber. der Kgl. Preussischen Akad. der Wiss.*, Vol. 44, 1908, Berlin.

Joseph Barrell: The Strength of the Earth's Crust (a series of articles), *Journ. of Geol.*, Vols. 22 and 23, 1914 and 1915.

G. F. Becker: Isostasy and Radio-activity, *Bull. Geol. Soc. of America*, Vol. 26, 1915, pp. 171-204.

Oskar Hecker: Bestimmung der Schwerkraft auf dem Atlantischen Ozean, sowie in Rio de Janeiro, Lissabon und Madrid, Kgl. Preussiches geodät. Institut, Berlin, 1903; Bestimmung der Schwerkraft auf dem Schwarzen Meere und an dessen Küste, sowie neue Ausgleichung der Schwerkraftsmessungen auf dem Atlantischen, Indischen, und Grossen Ozean, Zentralbureau der Internationalen Erdmessung, Berlin, 1910.

G. K. Gilbert: Interpretation of Anomalies of Gravity, *U. S. Geol. Surv. Prof. Paper 85-C*, 1913.

ellipsoid of revolution. These conditions as to the distribution of density do not apply universally. The earth's surface is very irregular, as is shown by the existence of continents and oceans.

Geodetic observations and their discussion show conclusively that the continents and oceans are not held in place by the strength of the earth's crust but exist and are maintained by a deficiency and excess of density, respectively, under them in the outer portions of the earth's volume. The investigations of the Survey show that at all places at a depth of about 120 kilometers (75 miles) below sea level there is an approximate condition of equilibrium as to pressures. This condition of approximate equilibrium has been given the name of *isostasy*. It has been proved by recent investigations that the area of the United States as a whole is in a state of isostasy to a very high degree of completeness. Whether small sections of this area are in such a condition must be a subject for further research. The extent of an area for which the topography may not be compensated is a question which should be solved as soon as practicable, for the result will be of great value to many branches of science.

The question may be raised, Why should a geodesist be interested in the question of the variations in the density of the materials in the earth's crust? The answer is that a knowledge of the variations of density enables him to apply corrections to the deflection of the plumb line and the observed values of the intensity of gravity, and thus obtain from the results very much more accurate values for the earth's figure.

While isostasy has been from the first a subject of great importance to the geodesist, it has become an even greater one to the geologist and seismologist. Many geologic hypotheses and theories must be modified to conform to the facts deduced from the results as to the variations of density in the outer portion of the earth, obtained from geodetic observations.

Triangulation

Thus far we have considered only the value of geodetic measurements in connection with the determination of the figure of the earth. They have also a very practical and immediate value in determining the positions of the topographic features with relation to the fundamental planes. The generally adopted system of co-ordinates is spherical and is referred to the plane of the equator for latitudes, the plane of the meridian through the observatory at Greenwich, England, for longitude, and the mean sea surface for elevation.

Owing to the station errors or deflections of the vertical at astronomic stations it is not possible to obtain the correct relative position of different places on the earth's surface by astronomic observations alone. This was strikingly shown in Porto Rico. The Spanish charts of this island were based upon astronomical stations at San Juan and Ponce on the northern and southern sides of the island, respectively. When the United States

became the possessor of this island, it was decided that a strong triangulation should be carried across the island from San Juan to Ponce, as the fundamental control from which new surveys should expand. The distance between the two places by triangulation was found to be about one mile shorter than the distance given by the two astronomic determinations. The triangulation across the island is subject to an actual error not greater than ten meters as a maximum.

The trouble was at the astronomic stations but was not due to errors in the observations. There was a relative deflection of the vertical of about 56″ of arc, due to the attraction of the island mass and the repelling force,

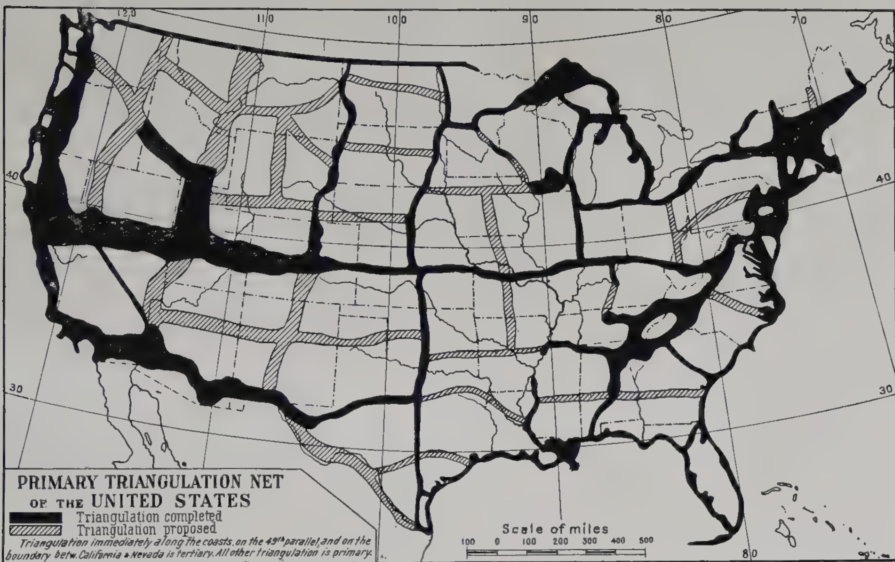

FIG. 9—Map showing the network of arcs of primary triangulation in the United States. (From Pl. 2, *U. S. Coast and Geodetic Survey Special Publ. No. 23*). Scale, 1:41,000,000.

The solid bands show the completed work and the shaded bands the work which will be done in the near future.

or what might be called a lack of attraction, of the vast volumes of the Atlantic Ocean to the north and the Caribbean Sea to the south.

The same phenomenon has been observed in the interior of the United States, where there are astronomic stations short distances apart and on opposite sides of a large mountain range.

It is evident from the above that an accurate map cannot be made over a large area where each of the separate sections is based on the astronomic position of the starting point of each of the various surveys. There will be overlaps and gaps which cannot be adjusted in a satisfactory manner. This difficulty is overcome by making a triangulation ahead of the surveys, for the connected scheme of triangulation will give the correct relative positions of the several stations. To obtain the most probable absolute positions

on the earth's surface of these stations a mean position for latitude and longitude is obtained by connecting into the triangulation scheme many astronomic stations. It is assumed that in a large area there are as many positive as negative deflections, and for a country the size of the United States this is very nearly true.

In the United States a mean astronomic position was adopted in 1901 and called the United States Standard Datum. Several years ago this datum was also adopted by Canada and by Mexico and then its designation was changed to that of the *North American Datum.* The triangulation of Alaska will soon be connected to that of the United States and Canada and then maps of its area will also be based on the continental datum. When the whole mapped areas of Alaska, Canada, the United States, and Mexico are based upon a connected scheme of triangulation, which will no doubt be done within the next few decades, this continent will be in a very enviable position, as far as control of maps is concerned. It should be said here that for the control of large areas, triangulation of the highest order must be extended in a network of long arcs. Lower-grade triangulation can be used to fill in the intermediate areas for the immediate control of the detailed topographic surveying and the map making.

Precise Leveling

In nearly all geographic work a knowledge of the elevation of the area under investigation is also necessary.

In rough work, such as topographic reconnaissance and exploration the barometer (mercurial or aneroid) gives results which are satisfactory; in fact, this is the only instrument adapted to such work. But the atmospheric pressure at any given place is so variable that the elevations obtained with the barometer are much in error, even when readings are made simultaneously at base stations, unless the line of base stations is carried along in very short steps.

For all accurate topographic work it is necessary to have leveling done with the wye or spirit level. This instrument and the results obtained with it are no doubt familiar to the reader. There are many such instruments in use, but the types of most interest to us are what are termed precise levels. With these, lines of levels may be extended thousands of miles with no appreciable error so far as the purposes of geography are concerned.

Eighty-three per cent of the precise leveling done in the United States has errors of closures of circuits which are not more than 1.57 thousandths of a foot per mile. As the precise level net is made up of many circuits, it is reasonably certain that the absolute error in the elevation of any precise level bench mark in the interior of this country is not more than one and one-half feet and the probable error is considerably less than that. It is necessary to cover the country with a network of precise leveling in order that errors of the elevations carried inland may not accumulate to a trouble-

some extent. This is readily understood when we consider the great distances from the coasts of this country to interior places. The error in ordinary leveling between any two contiguous bench marks might be small, but, when such leveling is carried from the Atlantic to a point in Minnesota, for instance, and to the same point from the Pacific Coast, the difference between the two elevations obtained for the same point might be many feet. Such an error would be a source of great confusion to the surveyor and map maker.

We have seen that the province of geodesy in geography is to furnish the correct dimensions of the earth, to determine approximately the distribution of material in the outer portions of the earth, and to furnish the correct positions and elevations on the earth's surface of the starting points for surveys and maps. Realizing the great importance of geodetic surveys and investigations, nearly all of the nations of the world have organizations for the purpose of carrying on this work; and to co-ordinate the results and to undertake the international phases of this important subject there is an International Geodetic Association, in which more than twenty nations are represented.

THE PASSING OF THE GREAT RACE*

By MADISON GRANT

[With four separate maps, Pls. I-IV, facing pp. 356 and 360.]

The maps reproduced in this article are attempts to represent by means of color diagrams the original distribution and the subsequent expansion and migration of the three main European races, known as the Mediterranean, the Alpine, and the Nordic. In the book by the writer which the maps originally illustrate, the physical characters of these races are clearly defined.

The Maximum Expansion of the Alpines with Bronze Culture, 3000–1800 B. C.

The first map (Pl. I) shows the distribution of these races at the close of the Neolithic, as well as their later expansion. It also indicates the sites of earlier cultures. The distribution of megaliths in Asia Minor, on the north coast of Africa, and up the Atlantic seaboard through Spain, France, and Britain to Scandinavia is set forth. These great stone monuments were for the most part the work of the Mediterranean race, using, however, a culture of bronze acquired from the Alpines. The map also shows the sites throughout Russia of the kurgans, or early mounds, whose distribution seems to correspond closely with the original habitat of the Nordics.

In southwestern France there is indicated the area where the Crô-Magnons, a highly developed ancient race, persisted longest, and where dim traces of it are still to be found. The site is shown of the type station of the last phase of the Paleolithic, known as the Mas'd'Azil—a great cavern in the eastern Pyrenees from which that period took its name of Azilian.

At the entrance of the Baltic Sea is also shown the type station of the Maglemose culture which flourished at the close of the Paleolithic and was probably the work of Nordics.

In the center of the district occupied by the Alpines is located Robenhausen, the most characteristic of the Neolithic lake-dweller stations, and also the Terramara stations, where a culture transitional between the Neolithic and the Bronze existed. In the Tyrol, the site of the village of Hallstatt is indicated, which gave its name to the first great iron culture.

The difficulty of depicting the shifting of races during twelve centuries

* Brief description of four maps accompanying "The Passing of the Great Race," by Madison Grant, recently published by Chas. Scribner's Sons, New York. The maps are here reproduced by the publishers' permission. The writer desires to acknowledge the great assistance of the American Geographical Society, and especially of Mr. Leon Dominian of the staff, for the collection and tabulation of material for the maps.

is not easily overcome, but the map attempts to show that, at the close of the Neolithic, all the coast lands of the Mediterranean and of the Atlantic seaboard up to Germany and including the British Isles was originally populated by the Mediterranean race, in addition, of course, to remnants of earlier Neanderthals and Crô-Magnons, who probably, at that early date, still formed an appreciable portion of the population.

The yellow arrows indicate the route of the migrations of Mediterranean man, who appears to have entered Europe from the east along the African littoral, reaching Italy by way of Sicily. But the main invasions passed up through Spain and Gaul into the British Isles, where from that time to this they have formed the substratum of the population. In the central portion of their range these Mediterraneans were swamped by the Alpines, as shown by the spreading green, while in northern Gaul and Britain the Mediterraneans were submerged afterwards by the Nordics, as will appear on the later maps.

The arrows and routes of migration shown on the yellow area of this map indicate changes which occurred during the Neolithic and perhaps earlier, but the pink and red arrows in the northern and southeastern portions represent migrations which were in full swing and in fact were steadily increasing during the entire period involved. The next map will show these Nordics bursting out of their original homeland in every direction and in their turn conquering Europe.

Between these two races, the Mediterranean and the Nordic, there entered a great intrusion of Alpines, flowing from the highlands of western Asia through Asia Minor and up the valley of the Danube throughout central Europe and thence expanding in every direction. Forerunners of these same Alpines were found in western Europe as far back as the closing Azilian phase of the Paleolithic, where they are known as the Furfooz-Grenelle race, and are thus contemporary in western Europe with the earliest Mediterraneans.

During all the Neolithic, the Alpines occupied the mountainous core of Europe, but their great and final expansion occurred at the close of the Neolithic and the beginning of the Bronze Period, when a new and extensive Alpine invasion from the region of the Armenian highlands brought in the Bronze culture. This last migration apparently followed the routes of the earlier invasions and, in the extreme southwest, it even reached Spain in small numbers, where its remnants can still be found in the Cantabrian Alps. The Alpines occupied all Savoy and central France, where from that day to this they constitute the bulk of the peasant population. They reached Brittany; and today that peninsula is their westernmost outpost. They crossed over in small numbers to Britain and some even reached Ireland. The Alpines in England were the men of the Round Barrows. On their march across Europe they had picked up a certain amount of Nordic blood. Practically all trace of this invasion has faded from the living popu-

lation. The Alpines also reached Holland, Denmark, and southwestern Norway, and traces of their colonization in these countries are still found.

The author has attempted to indicate the lines of this Alpine expansion by means of the solid green spreading over central Europe and Asia Minor, with outlying dots showing the outer limits of the invasion. Black arrows proceeding from the east denote its main lines and routes. Those Alpines who crossed the Caucasus passed through southern Russia, and a side wave of the same migration passed down the Syrian coast to Egypt and along the north coast of Africa, entering Italy by way of Sicily. This last African invasion left behind it as one of its relics the Giza round skulls of Egypt. This final Alpine expansion taught the other races of Europe, both Mediterranean and Nordic, the art of metallurgy.

The Nordics apparently originated in southern Russia, but, long before the Bronze Period, they had spread northward across the Baltic into Scandinavia, where they specialized into the race now known as the Scandinavian or Teutonic. On the map, the Continental Nordics are indicated by pink and the Nordics of Scandinavia are shown in red. At the very end of the period covered by this map, these Scandinavian Nordics were beginning to return to the continent[1] as Teutons. The routes of these migrations and their extent are indicated by red arrows and circles respectively.

To sum up, this map shows the expansion from central Asia of the round-skull Alpines across central Europe, submerging, in the south and west, the little, dark, long-skull Mediterraneans of Neolithic culture, while at the same time they pressed heavily upon the Nordics in the north and introduced Bronze culture among them.

This development of the Alpines at the expense of the Mediterraneans had a permanent influence in western Europe, but in the north their impress was of a more temporary character. They were in the first instance able to conquer the Nordics because of the superiority of bronze weapons to stone hatchets. But no sooner had they imparted the knowledge of the manufacture and use of metal weapons and tools to the Nordics than the latter turned on their conquerors and completely mastered them, as appears on the next map.

The Expansion of the Pre-Teutonic Nordics, 1800–100 B. C.

The second map (Pl. II) of the series shows the shattering and submergence of the green Alpine area by the pink Nordic area. It will be noted that in Italy, Spain, France, and Britain the solid green and the green dots have steadily declined and in central Europe the green has been torn apart and riddled in every direction by pink arrows and pink dots, leaving solid green only in mountainous and infertile districts. This submergence of the Alpines by the Nordics was so complete that their very

[1] Throughout this article the term "continent" refers alone to the central core of Europe and does not include Scandinavia and other peninsulas.

existence was forgotten, until in our own day it was discovered that the central core of Europe was inhabited by a short, stocky, round-skull race, originally from Asia. Today these Alpines are gradually recovering their influence in the world by sheer weight of numbers. On this map the green Alpine area is shown to be everywhere shrinking except in the countries around the Carpathians and the Dnieper River, where the Sarmatians and Wends are located. It was in this district that the Slavic-speaking Alpines were developing. Simultaneously with this expansion toward the west, south, and east of the Continental Nordics the Scandinavian Teutons appear on the scene in increasing numbers, as shown by the red area and red arrows, pressing upon and forcing ahead of them their kinsmen on the mainland.

The pink arrows in Spain show the invasion of Celtic-speaking Nordics, who were closely related to the Nordic Gauls who, a little earlier, had conquered France. This same wave of Nordic invasion crossed the Channel and appears in the pink dots of Britain and Ireland, where the intruders are known as Goidels. These early Nordics were followed some centuries later by another wave of related peoples who were known as Cymry in Britain and as Belgae on the continent. These Cymric Belgae probably represented the earliest Teutons who had crossed from Scandinavia and had adopted and modified the Celtic languages spoken by the Continental Nordics. These Cymric-speaking Nordics drove before them the earlier Gauls in France and Goidels in Britain, but their impulse westward was probably caused by the oncoming rush of pure Teutons from Scandinavia and the Baltic coasts.

In Italy the pink arrows entering from the west show the route of the invading Gauls, who occupied the country north of the Apennines and made it Cisalpine Gaul, while the arrows entering Italy from the northeast show the earlier invasions of the Nordic Umbrians and Oscans, who introduced Aryan speech into Italy. Farther east, in Greece and the Balkans, the pink arrows show the routes of invasion of the Achaeans and the kindred Phrygians of Homer as well as the later Dorians and Cimmerians. In the region of the Caucasus, the routes of the invading Persians are shown and, north of the Caspian Sea, the line of migration of the Sacae from the grasslands of southern Russia toward the east. In the inset map in the upper right corner is shown the expansion of these Nordics into Asia, where the Sacae and closely related Massagetae occupied what is now Turkestan and from this center swarmed over the mountains of Afghanistan into India and introduced Aryan speech among the swarming millions of that peninsula.

In the northern part of the main map the expansion of the Teutonic Nordics is shown, with the Goths in the east and Saxons in the west of the red area, but the salient feature is the expansion of the pink at the expense of the green and the ominous growth of the red area centering around Scandinavia in the north.

The Expansion of the Teutonic Nordics and Slavic Alpines, 100 B. C. to 1100 A. D.

This map (Pl. III) shows the yellow area greatly diminished in central and northern Europe, while it retains its supremacy in Spain and Italy as well as on the north coast of Africa. In the latter areas the green dots have nearly vanished and have been replaced by pink and red dots. In central Europe the green area is still more broken up and reduced to its smallest extent. In the Balkans and eastern Europe, however, two large centers of green, north and south of the Danube respectively, represent the expanding power of the Slavic-speaking Alpines. The pink area of the Continental Nordics is everywhere fading, and they are on the point of vanishing as a distinctive type. The expansion of the Teutonic Nordics from Scandinavia and from the north of Germany is now at its maximum, and they are everywhere pressing through the Empire of Rome and laying the foundation of the modern nations of Europe. The Vandals have migrated from the coasts of the Baltic to what is now Hungary, then westward into France, and finally, after occupying for a while southern Spain under pressure of the kindred Visigoths, to northern Africa, where they established a kingdom which is the sole instance we have of a Teutonic state on that continent. The Visigoths and Suevi laid the foundations of Spain and Portugal, while the Franks, Burgunds, and Normans transformed Gaul into France.

Into Italy for a thousand years floods of Germans crossed the Alps and settled in compact groups along the Po Valley. While many tribes participated in these invasions, the most important migration was that of the Lombards, who, coming from the basin of the Baltic, occupied the Po Valley in force and scattered a Teutonic nobility throughout the peninsula. The Lombard and kindred strains in the north give to that portion of the peninsula its present preponderance over the provinces south of the Apennines.

The conquest of the British Isles by the Teutonic Nordics was far more complete than was their conquest of Spain, Italy, or even northern France. When these Teutons arrived upon the scene, the ancient, dark Neolithics had very largely absorbed the early Nordic invaders, Goidels and Cymry alike. Floods of Saxons, of Angles, and later of Danes, crossed the Channel and the North Sea and displaced the old population in Scotland and the eastern half of England, while Norse Vikings, following in their wake, occupied nearly all of the outlying islands and much of the coast. Both these later invasions, Danish and Norse, passed around the greater island and completely inundated Ireland, so that the big, blond, or red-haired Irishman of today is to a large extent a Dane in a state of culture analogous to that of Scotland before the Reformation.

This map shows that the vitality of Scandinavia was far from exhausted after sending for upwards of two thousand years tribe after tribe across to the Continent and that it was now producing an extraordinarily vigorous type, the Vikings in the west and the equally warlike and energetic Varan-

gians in the east, who migrated back to the motherland of the Nordics and laid the foundations of modern Russia.

While all these splendid conquests were in full swing a little-known group of tribes was growing and spreading in eastern and southern Germany and in Austria-Hungary and occupying the lands left vacant by the Teutonic natives that had invaded Rome. From this center in the neighborhood of the Carpathians and in Galicia eastward to the head of the Dnieper River, the Wends and Sarmatians expanded in all directions. They were the ancestors of those Alpines who are today Slavic-speaking. From this obscure beginning came the bulk of the Russians and the South Slavs. The expansion of the Slavs is one of the most significant features of the Dark Ages, and the author has attempted to indicate the center of expansion of these tribes by green dots and green arrows, radiating in all directions from the solid green area in Europe. To sum up this map, the yellow area has steadily declined everywhere, while in western Europe the green area is now limited to the infertile and backward mountain regions. In eastern Europe, however, this same green Alpine area is showing a marvelous capacity for recovery, as will appear from the map of the races of today.

The red area is widely spread and occupies the river valleys and the fertile lands and represents everywhere the ruling, military aristocracy, more or less thinly scattered over a conquered peasantry of Mediterranean and Alpine blood. One phenomenon of dire import is shown on the map, where, coming from the districts north and east of the Caspian Sea, certain black arrows are seen shooting westward into Europe, reaching in one extreme instance as far as Chalons in France, where Attila nearly succeeded in destroying what remained of the Roman Empire. These arrows mark respectively Avars, Magyars, Bulgars, and other Asiatic hordes, probably for the most part of Mongoloid origin and coming from far-eastern Europe and central Asia beyond the range of Aryan speech. These hordes of Mongoloids destroyed the budding culture of Russia, while at a later date kindred tribes under the name of Turks or Tatars flooded the Balkans and the valley of the Danube,—these later invasions entering Europe from Asia Minor.

The Present Distribution of European Races

The preparation of the last map (Pl. IV), showing the present distribution of European races, was in some respects a more intricate task than that of the earlier maps. The main difficulty is that, as a result of successive migrations and expansions, the different races of Europe are now often represented by distinct classes. Numerically one type may be in a majority, as are the Rumanians in eastern Hungary, where they constitute two-thirds of the population. At the same time this majority is of no intellectual or social importance, since all the professional and military classes in Transylvania are either Magyar or Saxon. Under the existing scheme of showing

majorities by color these ruling minorities do not appear at all. In this last map the yellow is beginning to expand, especially in the British Isles. The green also is recovering somewhat in central and western Europe. But in the Balkans, eastern Germany, and Austria, and above all in Poland and Russia, it has largely replaced the former Nordic color. The pink, i. e. the Continental Nordics as a distinct type, has entirely vanished and has been everywhere replaced by the Teutonic red. This does not mean that there are no existing remnants of the Continental Nordics, but it does mean that these remnants cannot now be distinguished from the all-pervading and masterful type of the Teutonic Nordics.

In general, this last map, as compared with the earlier ones, although showing a steady shrinkage of the Nordic area, brings out clearly the manner in which it centers around the basins of the Baltic and the North Sea, radiating thence in every direction and in decreasing numbers. The menace of the continued expansion of the green area westward and northward into the red area of the Nordics is undoubtedly one of the causes of the present world war. This expansion began as far back as the fall of Rome, but only in our day and generation has this backward race even claimed a parity of strength and culture with the Master Race.

THE POPULATION OF FLORIDA:

REGIONAL COMPOSITION AND GROWTH AS INFLUENCED BY SOIL, CLIMATE, AND MINERAL DISCOVERIES

By ROLAND M. HARPER

The population of Florida has always been rather unequally distributed, mainly on account of the great variety of soil and topographic conditions in the state. About twenty-five geographical divisions (Fig. 1), each differing in density, composition, and rate of increase of population, are easily distinguished,[1] but most of these do not include the whole of any one county, so that it is not possible to get accurate statistics for them from census reports. If, however, the state is divided along county boundaries into five somewhat arbitrary divisions (Fig. 2) we can still get sufficient contrast to illustrate some interesting principles of anthropogeography.

In studying the historical development of population in limited areas by means of census statistics one should be careful to avoid being misled by changes of county boundaries between censuses; and such changes have been more frequent in Florida in recent years than in most other eastern states, on account of the rapid increase of population. (There are over three times as many counties in Florida now as there were in 1830, when the first census was taken.) But the boundaries of the divisions to be discussed presently have been very little affected by county changes since the first census of the state (or territory, as it was then), except that between the fourth and fifth divisions; and that difficulty has been circumvented by combining those two divisions for the first three censuses and making allowance in the computations for a considerable change that was made in 1905, by the creation of St. Lucie County.

The divisions here adopted, with their areas, are as follows:[2]

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[1] For descriptions of these divisions see—

R. M. Harper: Preliminary Report on the Peat Deposits of Florida, *3rd Annual Rept. of the Florida Geol. Surv.*, Tallahassee, 1910, pp. 197-375; specifically section on "Natural Divisions of the State," pp. 216-229 and Pl. 16.

R. M Harper: Geography and Vegetation of Northern Florida, *6th Annual Rept. of the Florida Geol. Surv.*, Tallahassee, 1914, pp. 163-437; specifically section on geographical divisions, pp. 190-343, and Fig. 40.,

[2] It has been quite customary to accept without question the figures for county areas given in the government census reports; but in Florida at least there are remarkable discrepancies between the figures for the same county at different censuses which cannot be wholly explained by changes of boundaries. So the areas have been measured independently by the writer by counting the townships and fractions thereof on a large map of the state on a scale of 10 miles to the inch which is published by the state agricultural department and revised every year or two (see note in the October *Review*, p. 303). Only land area is considered, but in some of the counties, particularly Monroe, it is impossible to decide just where land ends and water begins, and two different surveyors might make very different estimates. And in Palm Beach, Broward, and Dade Counties the Everglades, which cover a few thousand square miles, are more or less navigable in the rainy season, but they are usually counted as land, especially since the beginning of the drainage operations whose object is to convert the area into farms. The areas are expressed in multiples of 5 square miles, for it seems useless to attempt any greater accuracy than that under the circumstances.

1. *West Florida*, embracing the present counties of Escambia, Santa Rosa, Okaloosa, Walton, Holmes, Washington, Bay, Jackson, and Calhoun. Area, 7,515 square miles.

2. *Middle Florida.* Franklin, Liberty, Gadsden, Leon, Wakulla, Jefferson, Madison, Hamilton, Taylor, Lafayette. 7,225 square miles.

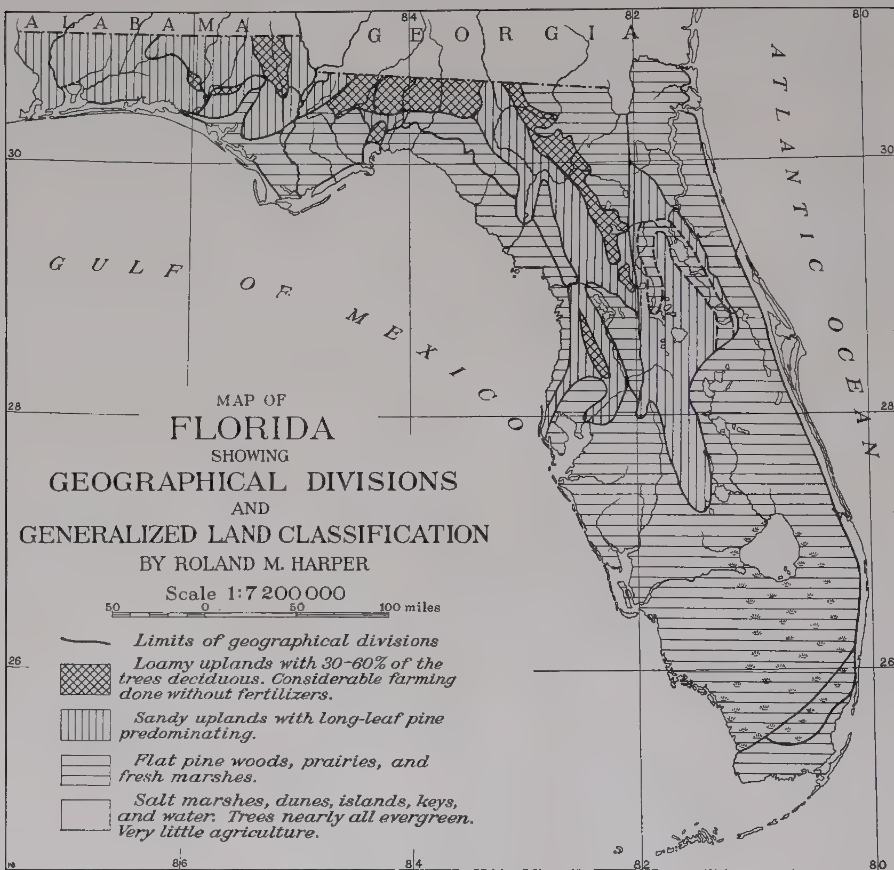

FIG. 1.

Note: The small area on the east bank of the Apalachicola River at the Georgia boundary (85° W.) should be ruled with the symbol indicating loamy uplands.

3. *Northeast Florida.* Suwannee, Columbia, Alachua, Baker, Bradford, Nassau, Duval, Clay, Putnam, St. John's. 7,415 square miles.

4. *Central Florida.* Levy, Marion, Volusia, Citrus, Hernando, Pasco, Sumter, Lake, Seminole, Orange, Pinellas, Hillsborough, Polk, Osceola, Brevard. 14,485 square miles.

5. *South Florida.* Manatee, DeSoto, Lee, St. Lucie, Palm Beach, Broward, Dade, Monroe. 16,530 square miles.

West and Middle Florida have rivers for their eastern and western boundaries (except that a small part of Franklin County is on the west

side of the Apalachicola River) and have long been recognized in popular parlance. The southern boundary of Northeast Florida corresponds roughly with the line between cotton and oranges and is the line at which it was proposed at the 1915 session of the Legislature to cut the state in two. The first three divisions, which are of very nearly the same size, were described

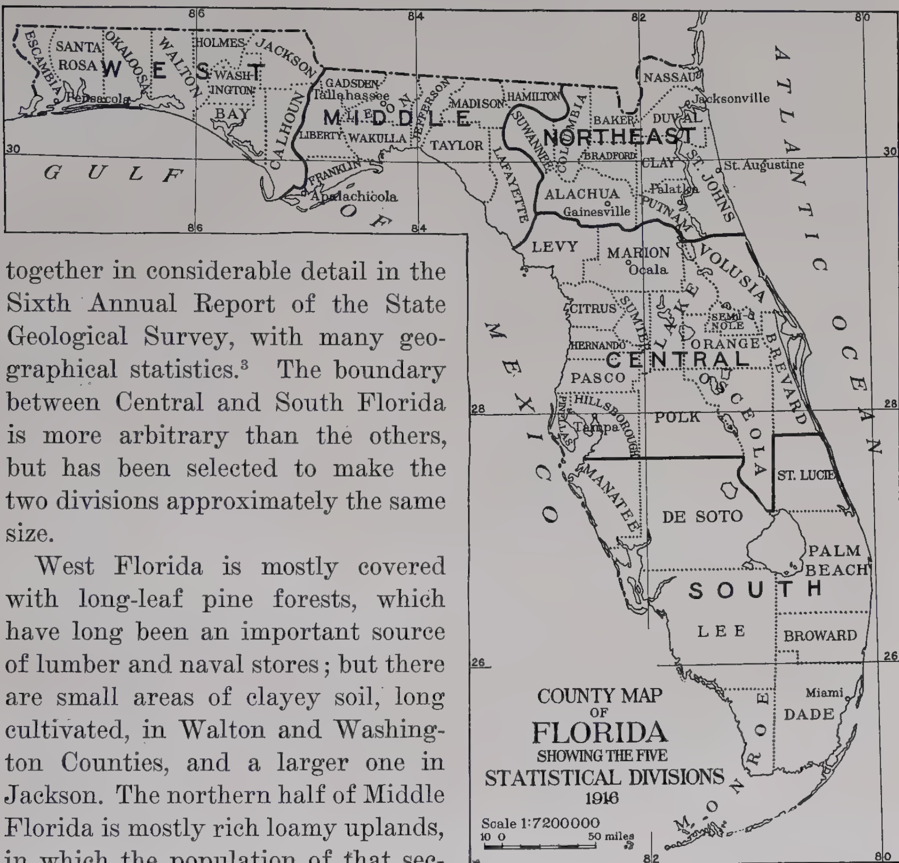

FIG. 2.

together in considerable detail in the Sixth Annual Report of the State Geological Survey, with many geographical statistics.[3] The boundary between Central and South Florida is more arbitrary than the others, but has been selected to make the two divisions approximately the same size.

West Florida is mostly covered with long-leaf pine forests, which have long been an important source of lumber and naval stores; but there are small areas of clayey soil, long cultivated, in Walton and Washington Counties, and a larger one in Jackson. The northern half of Middle Florida is mostly rich loamy uplands, in which the population of that section has always been chiefly concentrated, and agriculture is the leading industry there. The southern half, however, has considerable areas of damp, uninhabited flat pine woods. Northeast Florida is mostly sandy pine woods which have been the scene of active lumbering operations, but there is a belt of rich hammock land in Suwannee, Columbia, and Alachua Counties. Jacksonville, the state's most important seaport and railroad center and consequently the largest city, is located in this division, and that of course has an important influence on the population statistics.

Central Florida has a few hundred square miles of fertile hammocks in

[3] Second paper mentioned in footnote 1.

Marion and Hernando Counties, but the remainder is mostly pine land, which was considered almost worthless for agricultural purposes a few decades ago. Since 1888 there has been considerable phosphate mining in the western half of this section; and the winter tourist business is another flourishing industry. The cultivation of the strictly tropical fruits, which cannot endure frost, is chiefly confined to South Florida, which has very little land suitable for ordinary farming as practiced in the northern part of the state and in the South generally. Tourists have also contributed largely to its wealth in recent years.

Some other geographical features of the several divisions will be brought out in discussing the population table.

The United States government has made a census of Florida at every decade beginning with 1830, and the state agricultural department has done likewise at similar intervals, beginning with 1885. The government census of 1870 is admitted by the Census Bureau to have been very incomplete for the southeastern states, and consequently it is left out of consideration here, for any comparisons of the returns from it with those of the preceding and following censuses would be misleading. Separate figures for whites and negroes are not available for the government census of 1830 and the state census of 1885. In the state census of 1905 as published the figures do not balance, presumably on account of typographical errors, and it is no longer possible to check them from the original manuscript, but these errors do not make more than a few hundred difference in the totals. (The trouble is mostly in the returns for Volusia County.) In most of the censuses the county totals include a few Indians, Chinese, etc., and are therefore greater than the sum of the whites and negroes. In the 1915 census convicts and lunatics in state institutions do not seem to be counted in the counties where they are stationed, but there are only about a thousand of each class, and they do not materially affect the sectional totals. The Seminole Indians of the Everglade region do not seem to have been counted since 1900, but there are probably only a few hundred of them.

The following table[4] gives for each of the five divisions and for the whole state the density of population in inhabitants per square mile at each census (omitting that of 1870 for the reason given), the percentage of whites at each census except those of 1830, 1870, and 1885, and the percentages of decennial increase of population at each of the last six censuses. By giving the increase for decades and not for five-year periods comparison between state and government censuses is avoided, but the reader can make such comparisons for himself by means of the figures for density of population.

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[4] A somewhat similar table, prepared by the writer about a year ago, is incorporated in the report of the fourth state census (noticed in the October *Review*, p. 303), as Table 3, pp. 18-19. The principal differences, for which the state authorities are mainly responsible, are: the addition of the absolute figures for population, the omission of the race percentages for 1840 (which I did not get until a few months later), the inclusion of the inaccurate 1870 census, the substitution of quinquennial for decennial percentages of increase at the last seven censuses, and a few errors, such as 1.9 instead of 1.8 for the density of population of Northeast Florida in 1840, and 6.0 instead of 11.1 for Middle Florida, 1880.

The fact that different censuses were not all taken at the same season has had some effect on the apparent percentages of increase in Florida, on account of the considerable seasonal fluctuations of population. The last government census was taken about two months earlier than previous ones, and the last state census was taken in July and August, when thousands of Floridians were away for the summer.

Because of the limitation of the printed page to two dimensions, three kinds of statistics have to be put in the same column, which is a little troublesome to the reader, but this difficulty is partly overcome by printing the figures for density of population in heavier type.

Table Showing Density, Racial Composition, and Growth of the Population of Florida, 1830-1915

Divisions ——> Land Area (square miles) ——>	West 7,515	Middle 7,225	Northeast 7,415	Central 14,485	South 16,530	The State 53,170
1830. Density	**1.3**	**2.2**	**1.1**	**0.04**		**0.65**
1840. Whites	55.5%	41.8%	62.9%	86.7%		51.3%
Density	**1.6**	**3.8**	**1.8**	**0.05**		**1.0**
1850. Whites	62.6%	42.6%	60.5%	69.3%		54.0%
Density	**2.7**	**5.4**	**2.3**	**0.34**		**1.6**
1860. Whites	65.8%	44.5%	58.7%	59.1%	70.0%	55.4%
Density	**3.9**	**7.4**	**4.8**	**1.2**	**0.25**	**2.5**
1880. Whites	60.5%	35.4%	52.5%	68.5%	76.2%	53.5%
Density	**6.0**	**11.1**	**11.0**	**3.1**	**1.0**	**6.0**
1885. Density	**7.1**	**10.8**	**14.4**	**4.9**	**1.4**	**6.4**
1890. Whites	60.4%	39.0%	52.5%	71.0%	77.2%	57.5%
Density	**8.4**	**11.2**	**15.8**	**6.3**	**1.9**	**7.4**
Increase	39.2%	2.3%	44.3%	108.5%	96.0%	45.2%
1895. Whites	64.0%	38.7%	53.0%	69.3%	78.0%	58.4%
Density	**10 5**	**12.4**	**18.2**	**8.1**	**2.2**	**8.8**
Increase	47.1%	13.8%	26.3%	63.7%	56.6%	37.3%
1900. Whites	62.1%	40.0%	49.9%	64.5%	77.6%	56.2%
Density	**12.6**	**14.0**	**20.9**	**8.8**	**2.6**	**10.0**
Increase	49.9%	22.9%	31.7%	39.6%	34.1%	35.0%
1905. Whites	63.0%	41.4%	49.1%	63.1%	74.6%	56.8%
Density	**14.7**	**13.7**	**23.7**	**11.7**	**3.7**	**11.6**
Increase	39.9%	10.9%	30.1%	43.9%	69.7%	32.3%
1910. Whites	65.2%	40.7%	52.7%	65.4%	74.3%	59.0%
Density	**18.0**	**16.1**	**28.0**	**15.3**	**4.4**	**14.2**
Increase	42.7%	15.3%	34.3%	72.7%	73.5%	42.4%
1915. Whites	66.4%	41.4%	53.3%	67.2%	73.6%	60.7%
Density	**21.3**	**17.5**	**31.7**	**19.8**	**6.9**	**17.4**
Increase	45.3%	27.8%	33.7%	68.8%	87.0%	49.9%

In Florida, as in other southeastern states, negroes are usually most abundant in agricultural sections, and in 1840, when the population of West Florida was largely concentrated on the rich plantations of Jackson County, the percentage of whites in that division was only 55.5. Since then the exploitation of the pine forests has gone on at a rapid rate, white farmers have taken possession of the once despised sandy pine lands in increasing numbers, and at subsequent censuses the proportion of whites has never been less than 60 per cent. The rate of increase of population in West Florida has never been much greater or less than that of the state as a whole.

Middle Florida has a larger area of naturally fertile soil than any other division, and the early settlers soon located this by means of its dense hard-

wood forests. Agriculture became the leading industry at an early date, and large plantations with a predominance of negroes were the rule. As the growth of this section came at an early period, the increases in later decades have been comparatively small, as has been the case with many other fertile regions in other states. (If the hardwood and pine sections of Middle Florida were separated in the statistics still greater contrasts would be brought out, for some of the richer counties have been almost at a standstill in recent decades.) In 1830 and 1840 this division contained nearly half the population of the state, but it was overtaken in density of population by the northeastern division about 1881, by West Florida about 1904, and by Central Florida about 1912. The proportion of whites has not varied much from 40 per cent since the first census.

Northeast Florida has about the same amount of rich and poor land as West Florida, and its development has been similar in many respects. Its principal seaport, Jacksonville, has grown faster than West Florida's, Pensacola, probably mostly because of better railroad facilities, and this has given the section a larger population, especially of negroes. Between 1850 and 1860 the population more than doubled, and since the Civil War the decennial increase has never been less than 25 per cent. The numbers of the two races are nearly equal.

Very little of the land in Central Florida outside of Marion County was capable of cultivation by ante-bellum methods, and in 1860 there was only a little over one inhabitant to the square mile. Soon after the war the climate and scenery, and the possibility of raising oranges, began to attract settlers, and between 1880 and 1890 the population more than doubled. The discovery of phosphate rock in the western portions in the latter part of that decade doubtless had something to do with the increase. But the severe freezes of 1895 and 1899 struck the citrus industry a staggering blow and caused many recent immigrants to leave.[5] Between 1890 and 1900 the total population of Central Florida increased only 39.6 per cent and the white population only 27.2 per cent, and Lake, Orange, Osceola, and Brevard Counties actually lost population during that decade. The increase from 1895 to 1905 was nearly as small, but normal conditions were soon afterward restored. The proportion of whites to negroes has averaged about two to one ever since 1870.

South Florida has had the most phenomenal development of any section of the state. When the first census of Florida was taken it had only a few hundred inhabitants, and nearly all of those were in Key West. As late as 1880 there was only one person to the square mile. The soils, without any important exception, are very deficient in potassium,[6] one of the essential

[5] In this connection see articles by R. G. Robinson on "South Florida Before the Freeze" and "South Florida Since the Freeze," in *Lippincott's Magazine* for January and February, 1897; also *7th Annual Rept. of the Florida Geol. Surv.*, 1915, p. 124.

[6] The scarcity of potassium in the soils of peninsular Florida is probably due to two essentially independent causes: first, the remoteness from regions of igneous rocks and alluvial sediments, and, second, the leaching effect of the copious summer rains.

elements, and no extensive agriculture was possible there before the opening of the German potash mines in the third quarter of the nineteenth century.[7] (The same might be said of the long-leaf pine lands of the other sections of the state.) Even yet several thousand square miles of Everglades and wet prairies are uninhabitable. There were no railroads in South Florida until about 1890; but the mild climate was a powerful attraction, and as soon as the region became reasonably accessible tourists and settlers came in large numbers. The effects of the freeze of 1895 are noticeable in the statistics, but in the decades ending 1905, 1910, and 1915 the increase has been over 69 per cent. The drainage operations in the Everglades, although they have added very little to the habitable area as yet, have probably had something to do with the very large increase in the last decade. It is an interesting fact that in the "scientific" farming of South Florida the negro has little place, and the percentage of whites has never been less than 70 per cent.

Taking the state as a whole it is noteworthy that the whites have always been in the majority, and the proportion of them has increased a little in every decade, except at the time of the Civil War and the two great freezes. The rate of increase of population in Florida has long been more rapid than in any other eastern state.

According to the Statistical Atlas of the United States, published by the federal Census Bureau in 1914, the center of population of Florida in 1880 was near the present station of Hines, in Lafayette County. By 1890 it had moved about 19 miles southeastward, doubtless on account of the discovery of phosphate and other circumstances previously mentioned, which led to the rapid settling up of the peninsula at that time. (The use of German potash and Chilean nitrate, which are much needed on the peninsula, practically began during that decade.) But between 1890 and 1900 the center of population moved about 4 miles west-southwest, a change in direction mainly attributable, no doubt, to the exodus from the orange-growing districts because of the two severe freezes of the decade. By 1910 the development of the peninsula was again in full swing, and the center had moved across the Suwannee River, to a point about halfway between Vista and Sumner, in Levy County. Its location for 1915 has not been determined, but it is doubtless still farther southeast.

If, in this brief sketch, the state had been divided up more minutely, into natural geographical divisions, and more of the environmental and economic factors had been taken into consideration, many additional facts of considerable interest and significance could have been brought out. But it will at least serve, it is hoped, to show some of the relations of population to soil and climate, and discoveries of fertilizing materials in Florida and elsewhere, which do not seem to have been sufficiently emphasized before.

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[7] In 1909-10 the farmers of South Florida spent $16.95 for fertilizers for each acre of improved land, as compared with $1.42 for the rest of the state and 24 cents for the whole United States.

THE DISTRIBUTION OF PEOPLE IN JAPAN IN 1913

By MARK JEFFERSON

The most striking feature of human distribution in Japan appears to be the belt of maximum population that lies along the shores of the Inland Sea and continues eastward, with a little northing, toward Tokyo. All the pre-

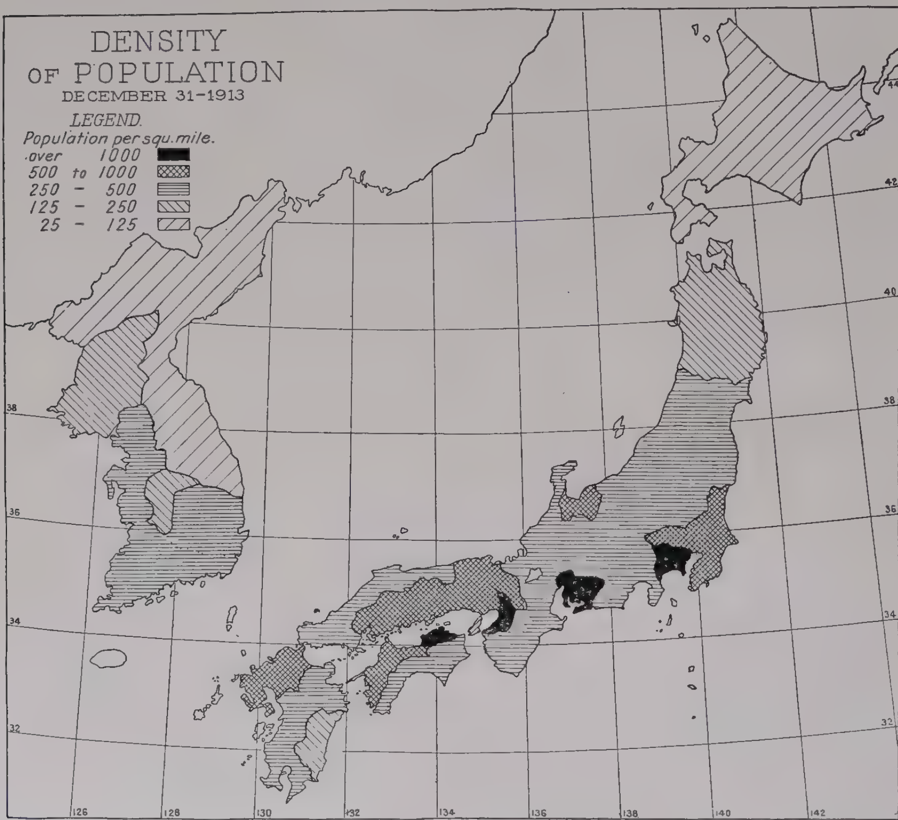

FIG. 1—Sketch map of the population density of Japan and Korea on December 31, 1913, according to data supplied by Professor N. Yamasaki of the Geographical Institute of the University of Tokyo. Scale, 1:16,000,000.

fectures of the empire that have more than a thousand people to the square mile—the black patches of the map (Fig. 1)—lie in this belt. Almost all the cross-lined ones, too, the regions of more than 500 people to the square mile, are in the same strip. Another aspect of this feature of Japanese anthropography comes out on Figure 3, the diagram of great cities, whereon the shape and size of the symbols indicate to the eye the population to the nearest hundred thousand. In Japan, as elsewhere, the denser popu-

lation-groups have created great cities to serve them through the manufacturing and distribution of products. Kanazawa is the only large city of Japan proper that does not lie in the Inland Sea belt. The remaining eight are all larger than Kanazawa. From west to east they are (the numbers in parentheses represent the population in hundred thousands): Nagasaki (2), on the western island Kiushiu; thence eastward in Honshiu—Hiroshima (1), Kure (1), Kobe (4), Osaka (12), Kyoto (4), Nagoya (4), Yokahama (4), and Tokyo (21). In Korea the two cities Ping Yan (2)

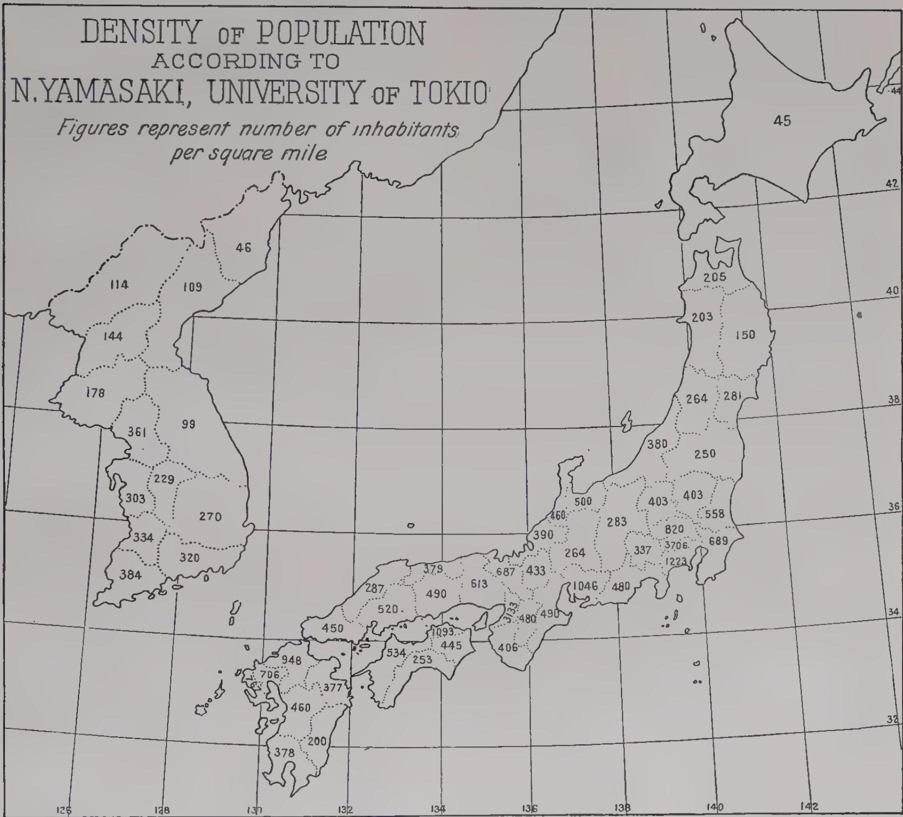

Fig. 2—Sketch map showing the population density on December 31, 1913, of each prefecture in Japan and Korea. Scale, 1:16,000,000.

and Seoul (3) lie in the more densely populated regions of the longer western slopes of the peninsula.

On Figure 2 is shown the population density of each prefecture, bringing out the salient facts in a little more detail. Thus, on the northern shore of the Inland Sea occur population densities of 450, 520, 490, and 613. Along the southern shore are 948, 534, and 1093. At the east end of the sea is Osaka prefecture, with 3133 people to the square mile, and farther to the eastward follow 490, 1046, 480, 1223, 3706, and 689. These are the greatest

population densities in the empire. Northward the numbers diminish rapidly, until in Yezo (Hokkaido) the density is only 45. Still farther north Japanese Sakhalin (Karafuto) has but 3 people to the mile. Korea, too, has its greatest density near the southern end, in about the latitude of Japan's dense belt.

The concentration of people in the Inland Sea belt is mainly due to the location in that neighborhood of the only considerable plains of the country. Japan proper has a mean density of population of 353 people to the square mile, but only 20,000 square miles, or 13 per cent, of the total area are cultivated, in a land where agriculture is the dominant occupation. The islands have too much mountain and waste land that the people are unable to utilize, in spite of a vast application of labor to terrace cultivation. Among the mountains only threads and strips of settlement can wind their way along valley floors and lower slopes, but on the plains that border the Inland Sea the fields are continuous, and a dense population tills them. Nagasaki on Honshiu owes much to coal-fields, like the cities of the English Midlands, but this is the exception among Japanese regions. "All the larger towns, with the exception of Kyoto, may be said to derive their prosperity from the comparatively wide and fertile plains in which they are situated."[1] The largest plain in Japan is that on which stands the city of Tokyo. Not counting the city, the whole 2,700 square miles of the plain supports nearly 2,000 people to the square mile.

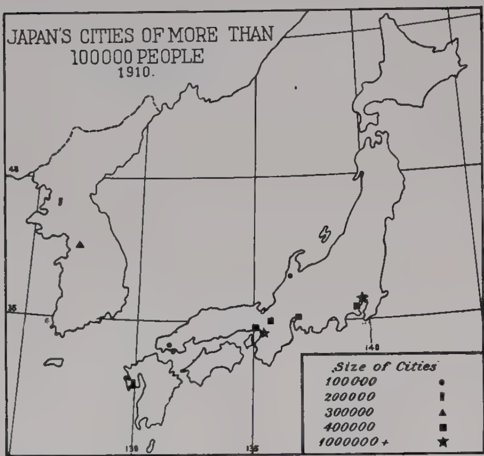

FIG. 3—Sketch map showing location and size of cities of more than 100,000 inhabitants in 1910 in Japan and Korea. Scale, 1:30,000,000.

This crowding in southern Japan is in strong contrast with the sparse settlement of Yezo, with only 45 people to the square mile. Severe winters give life in the north a harsher aspect, but the economic pressure from the crowded south is causing the population of Yezo to increase proportionally faster than in any other part of the empire.[2] As will be seen from the table that follows, the population of Yezo has almost trebled in the last fifteen years, out of all relation to increments elsewhere. But it has been steady. There were in Yezo, in 1898, 610,155 people; in 1903, 843,615; in 1908,

[1] W. B. Mason: Japan, in "The International Geography," edited by H. R. Mill, New York, 1909, pp. 544-554; reference on p. 552.

[2] Compare note on "Japanese Internal Colonization" in the February *Review*, p. 144.

Area, Population, and Population Density of the Prefectures of the Japanese Empire, December 31, 1913, according to Professor N. Yamasaki*

Prefecture †	Number of Inhabitants		Area square ri	Density per sq. mile
	1898	1913		
Karafuto (Sakhalin)	....	44,356	2,136	3
Hokkaido (Yezo)	610,155	1,650,000	5,987	45
Honshiu				
Aomori	612,171	747,200	636	205
Akita	775,077	918,800	734	203
Iwate	720,380	827,500	1,039	153
Yamagata	829,210	950,700	597	264
Miyagi	835,830	912,700	484	281
Niigata	1,812,289	1,877,600	828	380
Fukushima	1,057,971	1,260,600	895	248
Ishikawa	781,784	779,400	272	480
Toyama	785,554	784,100	259	490
Nagano	1,237,584	1,448,600	879	283
Gumma	774,600	984,500	395	403
Tochigi	788,324	995,700	418	403
Ibaraki	1,131,556	1,290,000	396	558
Fukui	633,840	637,100	257	390
Gifu	996,062	1,065,000	706	264
Yamanashi	498,539	585,700	289	337
Saitama	1,174,094	1,304,700	249	820
Tokyo	1,507,642	2,809,600	139	3,706
Kanagawa	776,685	1,145,100	155	1,226
Chiba	1,273,387	1,367,400	329	699
Yamaguchi	986,161	1,060,900	395	454
Shimane	721,448	750,800	429	287
Hiroshima	1,436,415	1,624,500	548	520
Tottori	418,929	455,200	241	339
Okayama	1,132,000	1,234,200	441	490
Hiogo	1,667,226	2,048,500	546	613
Kyoto	931,576	1,222,700	296	687
Osaka	1,311,909	2,175,700	115	3,133
Wakayama	681,572	757,700	292	406
Shiga	712,024	671,200	261	433
Nara	538,507	580,200	258	480
Miye	996,406	1,077,900	351	487
Aichi	1,591,357	1,962,500	327	1,046
Shidzuoka	1,195,286	1,461,800	495	483
Shikoku				
Yehime	997,481	1,093,100	370	534
Kochi	616,549	690,200	460	253
Kagawa	700,402	744,100	120	1,093
Tokushima	699,398	724,700	268	445
Kiushiu				
Nagasaki	821,323	1,082,600	267	767
Saga	621,011	678,600	158	706
Fukuoka	1,362,743	1,808,200	319	948
Kumamoto	1,151,401	1,279,300	482	458
Kagoshima	1,104,631	1,368,700	592	379
Miyagi	454,707	585,600	502	200
Okinawa	453,550	No such prefec	ture now.	
Chosen (Korea)				
Kankyo Hokudo	....	488,319	1,760	46
Heian Hokudo	....	1,120,366	1,636	114
Heian Nando	....	1,008,287	1,164	144
Kankyo Nando	....	1,092,697	1,671	109
Kokaido	....	1,176,991	1,102	178
Keikido	....	1,657,759	765	361
Kogendo	....	984,915	1,721	95
Chusei Nando	....	1,047,686	576	303
Chusei Hokudo	....	680,251	495	229
Keisho Hokudo	....	1,829,040	1,133	270
Zenra Hokudo	....	1,037,975	514	335
Keisho Nando	....	1,599,064	833	320
Zenra Nando	....	1,735,603	753	384
Taiwan (Formosa)	2,781,222	3,543,553	2,332	257

* The census is not complete and a few figures are only "almost accurate." With regard to the areas in square ri, Professor Yamasaki writes, "one ri equals 12,960 feet," whence it is calculated to equal 2.455 miles, and a square ri, 6.02 square miles, and 6 is taken as the factor to transform densities per square ri to densities per square mile. Population figures for 1898 from A. Supan: Die Bevölkerung der Erde, XI, pp. 36-37, *Ergänzungsheft No. 135 zu Petermanns Mitt.*, Gotha, 1901, are added for comparison.

† The prefectures, which are divisions not represented on most maps, may be located on Figure 2 with the help of the table. They are here named from west to east, beginning on the north. It is worth mentioning that in repeatedly going over the administrative divisions of the world, the writer has found Rand, McNally and Company's large Library Atlas more helpful than any other, including French and German works. The prefectures of Japan are, however, clearly shown on Pl. 168-169 of the new, sixth edition (1914) of Andree's Handatlas.

1,132,095; and in 1913, 1,650,000. The great contrast in density between it and the southern islands is bound to set population moving towards it, but the inconvenience of its northern situation will check the current long before Yezo attains the southern degree of density.

Korea is included for the first time in the Japanese census. For 1913 its inhabitants totaled 15,458,863. For 1898 Supan gave 5,415,439 *tax-payers,* and quoted Taxcollector-General McLeary Brown as estimating the total population at 10,000,000 at that time. It was doubtless much more, for the Japanese immigration into Korea has not amounted to millions. Thus is afforded another illustration of the fact that the only way to ascertain the number of people in a country is to count them!

The totals for Formosa indicate a considerable influx of Japanese. The data available do not define clearly the boundaries of native subdivisions in the interior, but it is clear that the most populous regions are on the coast, especially in the west and north. Karenko on the west has 1,160 people to the mile.

Only three prefectures in Japan show a diminution of population in the fifteen-year period 1898-1913: Shiga, the interior division in Honshiu near the 136th meridian; Ishikawa, directly north of Shiga on the coast, containing the striking Noto peninsula; and Toyama, adjoining Ishikawa on the east. Some other prefectures near these show small growth, circumstances perhaps attributable to the rugged mountainous nature of the region.

GEOGRAPHICAL RECORD

NORTH AMERICA

A Drake Memorial on the California Coast. On June 25 a memorial was erected on the shores of Drake's Bay, some thirty miles northwest of the Golden Gate, to commemorate the landing there of Sir Francis Drake on June 17, 1579, on his memorable voyage of circumnavigation. The memorial is in the form of a redwood post, some ten feet high, bearing the brass plate of which a photograph is herewith reproduced. This post is in a measure a replica of the one set up by Drake before his departure from the bay on June 23. An Elizabethan shilling has been inserted in the plate to represent the coin which, as Francis Fletcher, chaplain of the *Golden Hinde,* tells us, the original tablet bore: ". . . together with her highnesse picture and armes, in a piece of sixpence currant English monie, shewing itselfe by a hole made of purpose through the plate."

The post was erected with appropriate ceremonies by the Sir Francis Drake Association, a body of persons interested in commemorating Drake's voyage as a milestone in the history of the discovery of California. To the secretary of the association, Miss Josephine M. Hyde, the Society is indebted for the above account and the accompanying illustration. Similar ceremonies had been held on the same spot on the two years previous. An early advocate of a Drake memorial in California was the Rt. Rev. William Ford Nichols, Bishop of California, who, early in the nineties, urged the erection of a monument, particularly to commemorate the fact that Fletcher, the said chaplain, was the first to conduct a Christian service in the English tongue and the first to use the Book of Common Prayer within the present territory of the United States. Bishop Nichols' purpose was ultimately accomplished through the generosity of Mr. George W. Childs of Philadelphia, by whose gift a stately monument, known as the "Prayer Book Cross," was established and dedicated on January 1, 1894, not at Drake's landing place, as at first proposed, but on a well-chosen site in Golden Gate Park in San Francisco between the city and the ocean shore.

FIG. 1—Brass plate on redwood post erected on June 25, 1916, at Drake's Bay, California, by the Sir Francis Drake Association to commemorate Drake's landing there in 1579.

Drake's landing on the California coast was made, it will be recalled, on that memorable voyage when so many Spanish galleons fell into his hands off the western coast of South America. Although having come by way of the Straits of Magellan, he did not wish to return to England by that route for fear that the Spaniards, roused by his exploits, would lie in wait for him. He therefore decided to seek a passage from the Pacific to the Atlantic by sailing to the northward and then to the eastward. Accordingly in March, 1579, he set forth from the Bay of Panama and, proceeding in a northwesterly direction, for more than two months traversed unknown and trackless waters, sailing more than a thousand leagues without seeing land. By this time he had entered the region of the prevailing northwesterly summer winds of the North Pacific with their attendant cold and fog and was thus finally, in latitude 42°, forced to put about and run in shore. He struck the coast at the mouth of the small Chetko River, at the present boundary between Oregon and California, but, as this open roadstead afforded no protection, continued southward along the coast until he found a bay protected by a headland against the northwest. This was the bay that now bears his name. He himself named the contiguous territory Nova Albion, reminded of England by the similarity of the coast to the white cliffs of his native Devon.

The theory has also been advanced that Drake anchored in San Francisco Bay (Edward Everett Hale in Winsor's "Narrative and Critical History of America," Vol. 3, 1884). The improbability of this assumption has been ably demonstrated by

Professor George Davidson, a task for which he was peculiarly fitted by a rare combination of practical knowledge, both of seamanship and of the region concerned, and of critical acumen in the interpretation of historical sources. His paper, "Identification of Sir Francis Drake's Anchorage on the Coast of California in the Year 1579," published by the California Historical Society in 1890, was in part reprinted, together with the accompanying maps, in the *Bulletin of the American Geographical Society* (Vol. 40, 1908, pp. 449-469) on the occasion of the striking of the Drake medal by the American Numismatic Society, in an article by Mr. James D. Hague. The original source for this voyage is "The World Encompassed by Sir Francis Drake," based on the notes of Francis Fletcher, reprinted by the Hakluyt Society in 1854. Additional material is contained in Miss Zelia Nuttall's "New Light on Drake," likewise published by the Hakluyt Society (in 1914).

Halibut Fisheries of the Pacific Northwest. One of the most prompt commercial responses to the opening of the Grand Trunk Pacific Railway has been the diversion of the halibut trade to the port of Prince Rupert and the notable shipments made from that port to destinations in the east of the continent and in Europe (*Commerce Repts.*, No. 52, Washington, 1916; see also the note on "Canadian Fish for England," *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, p. 209). The sudden development of Canadian interests has aroused apprehension among the leaders of the American industry, for Seattle, long the headquarters of the fishery, is 500 miles farther away from the principal halibut fields. Ketchikan, the chief Alaskan center, is likewise filled with anxiety which can be dispelled only by a favorable railroad tariff. The Federal Government has endeavored to relieve the situation by locating new fishing banks nearer home. With this object the steamer *Albatross* was despatched with an expert crew to make a careful survey off the Washington and Oregon coasts. In an article entitled "From Herring to Halibut," Monroe Woolley (*Scientific American*, Vol. 114, No. 24, New York, 1916) relates the success of the undertaking. Several new fields were discovered, and from one of them nearly 1,000,000 pounds of halibut was taken during the 1915 season.

Exploration in the Yukon-Koyukuk Region, Alaska. That part of central Alaska lying between the Yukon and the lower course of the Koyukuk River, a right tributary, was until recently but little known. In 1913 it was explored by H. M. Eakin, and his results are presented in a report entitled "The Yukon-Koyukuk Region," recently issued as *U. S. Geological Survey Bulletin 631*. The region is essentially a rolling upland above which rise some higher mountain masses reaching altitudes of 5,000 to 6,000 feet. This upland is broken by broad valleys and lowlands. The mountain slopes are clothed with spruce trees up to altitudes of 2,000 feet. Spruce and birch also cover the lowlands. Above timber line the vegetation is chiefly moss. The timbered areas, notably in the lowlands, are broken by meadows covered with a luxuriant growth of grass. Moose, caribou, and bear still roam over much of this region, which is seldom visited by white men. No important mineral resources have been found in the Yukon-Koyukuk region, but many of the stream gravels carry some fine colors of gold. That some of these deposits are of commercial importance is shown by the fact that the placers of the Indian River district, which lie in the Yukon-Koyukuk region, have for several years been mined on a small scale. It is not improbable that other commercial placers may be found in the region, but the prospecting thus far done does not indicate the presence of any very rich deposits (*U. S. Geol. Surv. Press Bull. No. 294.*)

The August Forest Fire in the Ontario Clay Belt. The October *Review* (pp. 302-303) referred to the excessive burning off by the settlers of the forests in the clay belt of northern Ontario, the extensive area of cultivable land just north of the Laurentian-Hudson Bay divide which has recently been opened up by the Northern Transcontinental Railway. This practice has recently had a tragic result. On August 29 and 30, following an exceptional period of hot, dry weather, a conflagration broke out which ultimately affected an area of several hundred thousand acres, destroying a number of towns and settlements and causing the death of more than four hundred persons and the injury of many others. The greatest destruction was in the vicinity of Matheson, a town southwest of Lake Abitibi on the Temiskaming and Ontario Railway.

In number of lives lost the present fire is apparently the second most disastrous conflagration that has ever occurred in the North American forest zone, only the Peshtigo, Wisconsin, fire of 1871, when 1,500 persons lost their lives, having resulted in greater casualties. It ranks at least equal with the Hinckley, Minnesota, fire of 1894. For Canada it is by far the greatest disaster of its kind, far greater than the Porcupine fire of 1911, in the same region of the clay belt, in which 164 lives were lost. "The present fire is, to some extent, a secondary one, burning over territory on which the timber was

killed in 1911. This illustrates the well-recognized fact that the first fire does not consume the standing timber altogether but generally only kills it, leaving the scene ready for a still worse fire a few years later'' (*Forestry Quarterly*, September, 1916, p. 539).

Power from Tidal Currents in the Bay of Fundy. The swift tidal currents in the Bay of Fundy have been used up to this time only by means of large reservoirs, one of which is kept at high-tide level, the other at low-tide level with power gates between. A new scheme is being devised for using the current direct, with storage provided only for the four periods in the day when the tidal flow ceases. The best location is believed to be at Cape Spit where the waters of the Minas Basin are narrowed to a few miles. In addition to this advantage is the lack of obstruction to navigation, the exceptional swiftness of the currents, high cliffs and a central position with respect to a large population. Within a radius of 100 miles is an urban population exceeding that of any city in Canada, except Montreal (H. S. Culver: Power from Currents in Bay of Fundy, *Commerce Repts.*, March 25, 1916, p. 1196).

New England and Appalachian Forest Reserves. Congress has appropriated $3,000,000 for continuing the purchase during the next two years of forested lands at the headwaters of navigable streams in New England and the Southern Appalachians (*Amer. Forestry*, August, 1916, p. 473). Thus, after many vicissitudes, provision has been made for the continuation of the work so energetically carried on by the Forest Service during the last few years. The permanent good which this action insures is not to be measured in dollars, though the economic benefits are great. Permanent national forests under government control guarantees the protection of the two principal mountain groups in the East with all the value thereby implied in the way of health and recreation. Maps have been published in the Society's journal showing the regions where reserves have been made or were about to be undertaken (see, for New England, *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, p. 875; for the Southern Appalachians, *Geogr. Rev.*, September, p. 224).

This action of Congress also calls attention to the national park recently accepted by President Wilson under the title of the Sieur de Monts National Monument, the first of its kind to be established in the East. It is located on Mount Desert Island, includes some of the most beautiful scenery on the coast of Maine, and forms a unique gift to the nation (*U. S. Geol. Surv. Press Bull. No. 289*, September, 1916).

Federal Control of Hydro-Electric Power Resources. *The Nation* (January 20, 1916) comments on the passage of the Water Power Bill. The measure embodies one of the most vital concerns of internal development, the hydro-electric resources of the public domain. While the Federal Government has had authority over navigable streams, non-navigable waters have pertained entirely to the individual state and restrictive state legislation. Since the commencement of the period of rapid progress in 1900 much of the water power of the West has passed into the hands of large capitalists. Under the new law the small industries will have their opportunity and the public an increased enjoyment of benefits from this great national resource ''on the most favorable terms compatible with prompt exploitation.'' The Southern States afford an example of widespread private control of hydro-electric resources. The distribution of the transmission lines of North and South Carolina, Georgia, Alabama, and Tennessee is indicated on a map and a list of controlling companies is given in an article in the *Bulletin of the Inland Waterways Association* for February, 1916. A fundamental report on electric power development in the United States has recently been issued as a Senate document, which will be reviewed in a forthcoming number of the *Review*.

The Discovery of Fossil Human Remains in Florida. At Vero on the Atlantic coast in central-eastern Florida human remains have been discovered during the past year and a report on them has been published in the *American Journal of Science* (July, 1916, pp. 1-18). The human remains were found in association with vertebrate, fresh-water invertebrate and plant fossils which afforded a means for determining the age of the deposits. The results are of exceptional value since, in addition to a record of early man in America, there is available a record of the fauna and flora with which man was then associated. Careful sections through bedded deposits determined the fact that the human remains were found in a stratum whose continuations held the vertebrate remains. The other vertebrate remains included twelve species and represented the fox, deer, sloth, and mastodon. Five or six specimens represent extinct species. In addition, there have been found, in the older stream deposits, well-known fossils characteristic of the North American Pleistocene, such as the vertebrae and teeth of the large and

probably extinct crocodile, some bird and fish bones, and a considerable variety of turtles. The bones do not represent a human burial but were contemporaneous with the fauna with which they were found. The writer concludes that the small size of the streams which aggraded the surface above the bones and the thickness of the fresh-water marl which overlay them indicate a slow rate of deposition; and he holds that the bed in which the human remains were found was certainly deposited during the Pleistocene. The place in the geologic time scale of the fossiliferous beds overlying the human remains will be discussed after further study.

A New Fiber Plant in Cuba. This is not the first time that a weed has been turned to economic use—and ceased to be a weed. The latest is *malva blanca,* a plant that grows in Cuba. It has been especially troublesome to the tobacco planters of Pinar del Rio. In a region of good soil and abundant rain it grows to a height of twenty feet but usually does not exceed six to ten feet, with a stalk from a half inch to one and a half inches in diameter. It is anticipated that in time its fiber can be used to make at least part of the 20,000,000 sugar sacks annually needed in Cuba, and now imported principally from Calcutta and Dundee. Malva fiber is now sold at Havana, where it is used in making cloth shoes, and the supply is far below the demand (Garrard Harris: A New Fiber Available in Cuba, *Commerce Repts.,* Feb. 19, 1916, pp. 715-718).

EUROPE

Agriculture and the Decline of the Roman Empire. A causal relation between soil impoverishment and the downfall of the Roman Empire is presented by V. G. Simkhovitch in an exceptionally interesting article entitled "Rome's Fall Reconsidered" in the *Political Science Quarterly* for June, 1916 (Vol. 31, pp. 201-243). The testimony of ancient writers in proof of this contention is brought together, stress being laid on the gradual increase in acreage of farms as evidence of the farmer's impossibility to make a living on the seven-jugera (1 jugerum = ⅝ of an acre) property of the early Roman period. The growing dimensions of country estates are given from the time of Tiberius Gracchus, when the Gracchan allotments were of thirty jugera each, to the assignments of the Augustinian colony of Emerita, which were of four hundred jugera. Between these two periods it is known that the triumviral assignments had been of fifty jugera, while under Cæsar, the dictator, sixty-six and one-third jugera were awarded. The growth with time of agricultural property is therefore unquestionable. That this condition was due to the loss of fertility of the soil does not, however, follow necessarily, because estates become ampler as wealth is accumulated. The process is normal in every country and was not confined to Roman times.

Considerable importance is to be attached to a study of this type whenever economic facts of historical value are exhibited in their geographical setting. But to describe the Roman Empire on its wane as an abandoned farm on a gigantic scale, and attribute this condition principally to the depletion of humus in its soil, implies forgetfulness of the foreign agencies which contributed to the undermining of the empire. The invasions of barbarians from the north and the east would appear to some as having exerted as great an influence in the break-up of Roman world dominion.

The Roman Empire of Christian days was a complex organization when compared to the Latin state of the eighth century B. C. In other words it had progressed. The wants of its population increased not only in quantity but also in quality. The Roman farmer discovered that vines and olive trees paid better than grain. Sicily and the conquered coast of north Africa became the granaries of Italy. But, above all, the Roman had become a soldier and a leader, and it was natural that he should leave the less profitable occupation to the subjugated peoples.

The danger that too broad a generalization may become misleading is found in the citation of Greece as an earlier example of agricultural exhaustion. As an agricultural country, the dissected Greek area has always been a failure. Greece is a region of bays, gulfs, and islands and not of plains or valleys. The pre-Hellenic argonauts who sought the grain of Colchis were being unconsciously impelled by these features rather than by exhaustion of the soil of their country. They had very little arable land at their disposal. Furthermore, the lure of the sailor's life appealed more to the Greek mind than that of the unadventurous ploughman. As long as the steppeman of southern Russia or the Nilotic fellah was satisfied with the proceeds of unremunerative labor, he was made to provide for the bolder foreigner. And already in the day of Tiberius the Roman had learned the value of colonial enterprise.

The Fortieth Anniversary of the Madrid Geographical Society. The fortieth anniversary of the Real Sociedad Geográfica of Madrid was fittingly commemorated at

a special meeting held on March 27th of the present year. According to the account in the *Boletín* of the society for the second quarter of 1916, the session was opened by H. S. H. the Infante Don Carlos and addresses were read by officials of the Society and delegates from prominent scientific institutions in Spain and foreign countries. The secretary-general reviewed the society's activities and called attention to the studies in historical geography undertaken at various intervals. Among these are investigations dealing with the Roman province of Mauretania as well as important colonial studies relating to South America and a historical geography of Murcia. Problems of local interest, such as the revision of Spanish geographical nomenclature, are also engaging the attention of Spanish geographers. Lately considerable interest on the part of members has been centered on Spanish Morocco as an area of Spanish colonization and expansion. Among the works to be published under the auspices of the Society and which are now in preparation, mention should be made of the "Noticias del Peru" written by Lopez de Caravantes, Treasurer-in-Chief of the Indies (*Contador Mayor de las Indias*) and the celebrated "Islario" by Alonzo de Santa Cruz.

The society has also made great efforts to promote the study of geography in Spain and to urge the desirability of establishing professorships for this purpose in universities and colleges. As a result of this movement, a chair of geography was established in the Escuela de Estudios Superiores del Magisterio, and teachers of geography were appointed in normal schools of the country.

AFRICA

Physical Geography of the Southern Algerian-Moroccan Frontier. A classification of this borderland into natural regions has been obtained by Francis Rey, a French army officer, by combining geological and geographical observations made in the course of explorations undertaken between the years 1910 and 1912 (Recherches géologiques et géographiques sur les territoires du Sud-Oranais et du Maroc sud-oriental, *Revue de Géogr.* Vol. 8, 1914-1915, 175 pp.). The area investigated embraces nearly 40,000 square miles and is included between the parallels of 30° and 33° N. and the meridians of 0° and 5° W. Three main regions are distinguished. The steppes and the Shott Tigri form the most northerly. The mountainous intermediate region of the Saharan Atlas follows, while a southern region comprises the zone of *hammadas,* or Saharan plateaus.

The steppe region has an altitude varying between 3,600 and 4,600 feet. Originally a folded area similar to the Saharan Atlas, it has been transformed into a number of desertic peneplains. These forms are shown to be the result of five successive cycles of erosion, characterized by a persistent conflict between eolian and alluvial agencies. The transition from this natural region to that of the Saharan Atlas occurs without a break. Mountain features merge insensibly into those of the desertic peneplain type.

The distinctiveness of the Saharan Atlas is due to structure. In the west the mountain region shades off into that of the Moroccan Atlas. The area investigated by Rey is subdivided into three sub-regions, namely, the Tamlelt elevated plain, the Ksur and Figuig ranges, and the Moroccan Ksur ranges. The Tamlelt plain lies at an average altitude of about 3,900 feet. Its greatest length strikes east-west. In places upon its sandy surface, saucer-like depressions with a clayey bottom form the sites of oases with sparse verdure. Life in the region is centered around these patches of green. Beyond lies the bare plain with its Saharan flora. The Ksur mountainous region presents the appearance of an elevated plateau supporting a system of roughly parallel ranges. The altitude of the intervening plains decreases from north to south. Thus the descent into the *hammada* zone follows in steplike sequence. The Figuig ranges differ from the preceding in geological character. Jurassic limestones almost exclusively compose the rock strata. The folding is of a distinct Alpine type with upturned anticlinals, whereas in the Ksur region it is Jurassic in character. The limestone foundation combines with the desertic climate to convert the region into a land of desolation.

South of the Atlas the *hammadas* form a region which has been subjected to powerful erosive agencies. Beginning at the end of the Tertiary successive layers of this desertic formation have been deposited. Their surface is devoid of life and conveys an excellent impression of the Saharan desert. As a rule they are slightly tilted toward the south.

Special mention of the influence of eolian action is made in the course of this study. It is shown that, while the wind has exercised a destructive action in the northern zones of steppes and mountains, its effects have been constructive in the southern *hammadas,* where thick layers of sand have been deposited over landforms modeled by river erosion. The sand dunes, or ergs, carved by the wind thus provide a system of forms due to eolian action which overlie a morphological series due to river erosion.

From an economic standpoint the region is one of meager resources. Sheep raising

constitutes the most profitable occupation on the plateaus, and hopes are entertained of the possibility of creating a dry-farming industry. Mining may become an important source of revenue in the Atlas country.

The Rainfall of Nigeria and the Gold Coast. A discussion of the rainfall of Nigeria and of the Gold Coast was read by Mr. C. E. P. Brooks before the Royal Meteorological Society (London) on February 16, 1916 (*Quart. Journ. Roy. Meteorol. Soc.*, April, 1916). The region investigated consists of the low-lying coastal area, including the delta of the Niger, and the interior plateau, merging into the desert and intersected by the valleys of the Niger and Benue Rivers. The rainfall data of Nigeria have been reduced to a common period of ten years, 1904-1913, and maps have been constructed showing the average distribution for each month and for the year. The annual rainfall ranges from about 160 inches on the coast to less than 10 inches on the north of the plateau. The monthly maps show a minimum in January, with a range from about 2 inches on the coast to almost rainless conditions in the north, and a maximum in June, with about 28 inches in parts of the coast and less than 2 inches in the extreme northeast. The belt of maximum rainfall advances inland during the first half of the year, reaching its most northerly position in August. In this month there are areas of less than 1 inch along the southeastern Gold Coast and in the southwest of Nigeria. In all months the effect of the low-lying valleys of the great rivers is apparent in producing a smaller rainfall than on the surrounding plateau. A special study of the rainfall and pressure observations taken at Zungeru, in the northern provinces of Nigeria, discloses a fairly regular progression in the correlation coefficients between these elements, from a high positive value in April to a high negative value in August, and back in October. The probable explanation is found in the annual migrations of the equatorial belt of low pressure and of the tropical highs, the source of the rainfall of Nigeria being the moist indraught which replaces the rising air in regions where the sun's rays fall vertically at noon. Popularly expressed, the "rain follows the sun." The oscillation of the pressure belt, with the consequent variations in the annual rainfall, appear to be the governing factor in the climate. R. DeC. Ward.

ASIA

Carl Lumholtz's Return from Central Borneo. A despatch to the *London Daily Chronicle*, dated Batavia, October 2, and published in that paper's issue of October 4, a copy of which the Society owes to the courtesy of Mr. Herbert L. Bridgman, announces the return of Carl Lumholtz from his trip to Central Borneo, the plans for which were outlined at the time (*Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, p. 960). The route of the expedition lay up the Barito River, the largest of the south-flowing rivers, to its source, then across a secondary divide to the headwaters of the Mahakam River, which was descended to its mouth on the eastern coast. The expedition was primarily ethnological.

The Dutch government provided a lieutenant, a sergeant, and five native soldiers as an escort, as well as a surveyor and a photographer. After spending two months among the Dyaks of the Murung River, a side arm of the lower Barito, the expedition left the city of Bangermassin on December 9, 1915, on a government steamer. On reaching the limit of steam navigation, the party transferred to native boats manned by Malay boatmen. Later, in the headwater region, they were replaced by Dyak carriers. The Dyaks are the native inhabitants of Borneo; they have everywhere been pushed inland from the coast by the domineering Malays, who are much less reliable.

The expedition now reached the Busang River, one of the main sources of the Barito, in about the latitude of the equator. The current was very swift, especially during the excessive rainfall characteristic of February and March. Lumholtz reports having seen the Busang rise over six feet in a couple of hours. The stream is interrupted by a large number of rapids; these were circumvented by carrying boats and loads overland. Near the head of the Busang a number of natives were encountered from the Müller Mountains, a range forming part of the main divide of the island. The expedition crossed a secondary divide, however, at an elevation of 1,400 feet, which led to the Kaso River, a short source-stream of the Mahakam. The valley of this river is inhabited by Saputans, a crude friendly people who, a hundred years ago, were mere cave-dwellers in the mountains to the east.

Continuing down the Kaso the expedition reached the Mahakam River. The upper Mahakam valley here trends east-northeast for about one hundred miles and at the eastern end of this stretch occurs a series of great rapids which constitute a formidable natural barrier. As a consequence, the Dyaks living in this part of the valley have hardly been touched by outside influences. The Mohammedan Malays, for instance, have never been able to extend their influence above the rapids. Recently the practice of head hunt-

ing has been suppressed by the Dutch, the last case of this kind in this region having occurred at least five years ago.

It was in this region that Lumholtz spent the greater part of his time. In spite of the objection of the natives, he was able to secure many photographs and cinematograph pictures and take the measurements of 174 individuals. Quite a comprehensive ethnological collection was made, including children's games and folklore and numerous short vocabularies.

After this sojourn, the rapids of the Mahakam were passed in safety in three days. Many Dyaks have lost their lives there, and only recently a foreign trader was drowned. The expedition arrived on August 22, 1916, at Samarinda at the mouth of the river on the eastern coast, having during nine months covered by river a distance of over one thousand miles in native boats and nearly half as much in the steamer.

A geographical result of the expedition is a map of the route which corrects previous errors, especially in the watershed region of central Borneo. The maps of this district are, of course, based only on reconnaissances. The Busang River region has been surveyed only within the last ten years. The best representation of this area and the remaining territory shown is the standard "Schetskaart van de Residentie Zuider- en Oosterafdeeling van Borneo," on the scale of 1:750,000, published in 1913 by the Topographical Bureau in Batavia. The most complete account of the physical geography of the Barito drainage basin is to be found in "Topografische en geologische beschrijving van het stroomgebied van de Barito, in hoofdzaak wat de Doesoenlanden betreft," by G. L. L. Kemmerling (*Tijdschr. Kon. Nederl. Aadrijk. Genoot.*, Vol. 32, 1915, No. 5, pp. 575-641; No 7, pp. 717-774: listed in the February *Review*, p. 162), accompanied by a geological map, 1:750,000, based on the aforesaid topographic map.

Eastern Asiatic Expedition of the University of Pennsylvania Museum. In the June number of the *University of Pennsylvania Museum Journal* C. W. Bishop publishes a beautifully illustrated account of his recently completed journey in the Far East. The museum's Eastern Asiatic Expedition was a reconnaissance to determine the possibilities for archeological research over a wide area in the Orient. Commencing his surveys in the country centering round Nara and Kyoto, the nucleus of the early Japanese Empire, Mr. Bishop traveled over the border country, long disputed between the Empire and the aborigines, to Hakodate and thence to the island of Yezo. In the south of the island he visited modern Ainu settlements, remarking on the survival of such ancient features as the characteristic Ainu storehouse raised on piles above the ground and the Ainu interest in horse-raising. A later stage of the journey embraced Korea, where a favorable impression of the work of the Japanese government was obtained. Thence via the Liaotung Peninsula the author proceeded to Peking. Disturbed conditions in the upper valley of the Yellow River caused the abandonment of the original plan for study of the seat of the earliest Chinese civilization, and instead the journey was continued to Szechuan by way of the Yangtze River. The objective here was the famous caves in the sandstone hills of this western province. Native tradition attributes them to the work of the aboriginal barbarians. Mr. Bishop believes that this is correct and regards them as burial places.

POLAR REGIONS

Eskimo Migrations in Greenland. At Holstenborg, Greenland, well within the Arctic Circle, is one of the northernmost outposts of settlement and here V. C. Frederiksen, a resident missionary, has published a monthly journal, a volume of church hymns, a brief history of Greenland, and several literary translations, all in the Eskimo language, while at the same time carrying on archeologic investigations and making pastoral calls by dog sledge and kayak at the small native settlements scattered along three hundred miles of dangerous coast. Pastor Frederiksen, in another monthly journal called *Atuagagdliutit*, or "Reading Miscellany," published at Godthaab, Greenland, has expressed some very interesting views on Eskimo migrations according to an abstract by James Mooney in the *Journal of the Washington Academy of Science* (Vol. 6, 1916, No. 6, pp. 144-146.) The evidence of linguistics, geography, and archeology led him to conclude (1) that the Eskimo tribes reached Greenland from an original nucleus in the extreme west, (2) that they traveled southward along the coast to the east, and (3) that they decreased in number toward the north owing to the scarcity of game and building material. He believes that the Norse occupation about 1000 A. D. made a wedge between the east and west coast Eskimo and that natural communication was again established only after the extinction of the Norse colony about 1490. Some of the northerly tribes on the east coast starved to death; some of the southerly tribes were saved from a like fate at a later period only by contact with Danish colonists. The

superior capacity for civilization of the South Greenland Eskimo is explained by a strain of old Norse blood.

Glacial Features of the South Orkneys. Position near the edge of the Antarctic confers upon the South Orkneys special interest as a field for glacial study in relation to other South Polar regions. Advantage of this was taken by the Scottish National Antarctic Expedition which spent eleven months in 1903-04 on Laurie Island, the most easterly of the group (J. H. Harvey Pirie: Glaciology of the South Orkneys, *Trans. Royal Soc. Edinburgh,* Vol. 49, Part 4, Edinburgh, 1913). The South Orkneys appear as the remnant of a sunken and dissected upland with a latitudinal extent of 72 miles. Extensive glaciation at a time when the land stood at a much higher level accounts for the broad topographic expression now owing its detail to subaërial weathering. In this region the theoretical or climatic snow-line is probably some little distance above sea-level. The configuration of the land produces a number of more or less isolated ice sheets centering in roughly concentric form about the heads of the bays. The glaciers belong to the class first described by Arctowski as "suspended coastal glaciers" and later defined by Nordenskjöld as "ice-foot glaciers." For purposes of description they may be divided into three integral parts. The high slopes are sometimes distinguished from the main body of the glacier occupying the slope between the hills and the sea by a well-marked *bergschrund* which conforms rather closely to the configuration of the underlying surface. In these glaciers, unfed by snow fields, the snow passes directly into névé and glacier ice, a phenomenon assisted by the comparative frequency with which the mean day temperature of the air rises above freezing point. The glaciers end in snouts or in terminal cliffs. Observations on the snout glaciers show that the ice is either stationary or retreating slightly. Those reaching the sea terminate in regular cliffs ranging in height from 60 to 160 feet and affording good opportunity for the study of internal glacial structure.

PHYSICAL GEOGRAPHY

Breathing Wells. The "breathing" of wells has often been noted, and the relation between the inflow and outflow of air at the mouth of wells and the atmospheric pressure has at the same time been observed. Yet observations of this interesting phenomenon are not common. In a recent number of the *Monthly Weather Review* (Vol. 44, 1916, pp. 75-76) there are given the daily records of the "breathing" of a well at New Carlisle, Clark County, Ohio, during February, 1916. Rising pressure changes were accompanied by inspirations in 22 cases, and by no breathing in 4 cases. Falling pressure changes were accompanied by expiration 27 times, and by no breathing twice. A practical use of this breathing has been suggested in England, where private efforts have been made to utilize these conditions in forecasting probable gas explosions in mines. In the United States, the Weather Bureau authorizes its local forecasters to telegraph marked pressure changes to mine operators and thus enable the latter to form their own opinion as to the probability of danger. R. DeC. Ward.

Tropical Rains: Their Duration, Frequency, and Intensity. Tropical rainfalls are said to be intense, yet they are often exceeded by summer showers in middle latitudes. This is true, at least, for the rainfall of Baltimore, Maryland, compared with that of San Juan, Porto Rico, as is shown by Dr. Oliver L. Fassig in the *Monthly Weather Review* for June, 1916 (Vol. 44, pp. 329-337). The average duration of rains is eight hours in Baltimore, and one hour in San Juan. But the duration and frequency of excessive rains is the greater in the tropics. A consideration of the frequency of small rains shows that the tobacco sections of Porto Rico are located where rains of less than 0.1 inch are very numerous (as at Caguas, 160 a year); and that in one of the best coffee regions, in the western mountains, there are few days with such small amounts (for instance, Lares, 13). The average total rainfalls of the two places are about 70 and 100 inches respectively. The heavy rains come during the hurricane season, June to November, and in winter when the extra-tropical cyclones reach south to the island. The diurnal maximum of rainfall occurs shortly after noon at San Juan with a secondary high point at six in the morning. The afternoon rains are more intense but less frequent than the morning rains. The article is well illustrated with diagrams. One of the most striking is that of "rain autographs." Doctor Fassig's ingenious instrument, which records the duration of rainfall, allows the raindrops to make their own record by blurring the ink on a moving paper exposed under a small opening. In this way, rainfall too small to measure may leave its mark at the proper time. The autographs of San Juan show at a glance the usual intense, abrupt character of the tropical rainfall, while selected ones from Baltimore show both the heavy showers and the weaker long-drawn-out general rains of middle latitudes. Charles F. Brooks.

HUMAN GEOGRAPHY

Deserts Due to Deforestation. A popular but inaccurate account of the relations between forests and rainfall appears in a recent article by Moye Wicks (*Amer. Forestry,* October, 1916, pp. 598-606). This type of exaggeration of the effects of deforestation really harms the cause of forestry. Witness the following:

"It is certain that the arid lands we have in North America have been made so by the extermination of the trees through forest fires and, possibly, the destruction of trees for fuel and clearing for cultivation by the great prehistoric agricultural people who preceded the nomadic Indians."

"Palestine, now but a memory and a shrine, was at one time the most productive section of the ancient world, crowded with cities and villages."

"Utah illustrates the same scientific truth, but conversely, for the Mormons, who found the country treeless, have nearly doubled their annual rainfall, and have largely increased the size of their lakes and streams by planting orchards and by reforestation."

"Every intelligent man of mature years will recall instances, within his own observation, of diminution of rainfall going hand in hand with diminution of tree growth in the same locality—a steady decrease in regularity and amount of rainfall being perceptible wherever the forests have been devastated by man."

"Greece now supports only 5 per cent of the population it had when it produced sculptors, poets, orators, philosophers, statesmen and soldiers, whom modern times have not surpassed. Indeed, all the coast that abuts upon the Mediterranean suffers more or less from the practices that consign the treeless country to aridity."

The Increased Importance of Silver. A change in the economic status of silver is imminent. Within the last three years output has been reduced and within the last few months demand for coinage purposes has been increased. In 1912 the world production was over 224,000,000 ounces; in 1915 it was 13,000,000 ounces less (The World's Production of Silver in 1915, *Mining and Engineering World,* Feb. 6, 1916). The diminution is chiefly accounted for by the decline of mining in Mexico. Yet despite internal troubles this country still produces about 30 per cent of the world's supply. Production in the United States increased, the greatest advance among individual states being shown by Idaho. The whole country accounted for 36 per cent of the world's total. A proportionally greater increase was made by South America. During the year copper and tin mining became very active in Peru and Bolivia, and consequently the output of silver commonly obtained as a by-product was augmented. The increased demand for silver is attributable to the war. From the circulating currency of the belligerent nations gold has either been withdrawn or reduced in amount and the increased paper currency must rest largely on silver security. The recognition of this growing importance of silver is world-wide. To meet the shortage of silver coin Australia has established a federal mint. Although India, the largest consumer of silver for coinage purposes, reduced her usual demands at the beginning of the war, she must shortly reappear as a large-scale purchaser. Russia has been buying silver extensively in China and having it minted in Japan, a fact that recalls another feature of the situation, viz.: the proposed currency reform in China. The deplorable results ensuing from the depreciated paper money issued during the early stages of the revolution have led to a movement towards standardization of the monetary system. As it is, the silver money of China and Manchuria today has purchasing value 50 per cent greater than that of two years ago. A United States consular report (No. 130, June 3, 1916) instances the rapid rise in the case of the latter country. At the beginning of April of the current year the value of the silver yen was equal to 0.955 Japanese gold; at the end of the month it had risen to an equivalent of 1.03 gold. Such a situation should favorably affect the import trade of the country.

GEOGRAPHICAL NEWS

Anthropogeographical Models at the Children's Museum of the Brooklyn Institute. The Children's Museum of the Brooklyn Institute of Arts and Sciences about a year ago installed a series of six geographical models which will doubtless go far in arousing an interest in geography among its visitors and in helping them to visualize distant environments. Each model portrays some characteristic episode in the life of the inhabitants of the region it represents. The subjects of the models are as follows: (1) Brazilian Indian hunting monkeys with a blow-gun in the tropical forest, (2) South Sea islanders dragging their boat out of the surf after a fishing trip, (3) Bushmen hunting kangaroos in the Central Australian desert, (4) Masai (British East Africa) attacking a lion that has leaped over the barricade of one of their villages

and seized a sheep, (5) Bedouins at an oasis in the Sahara welcoming a Berber traveler, (6) Afghan mountaineers stalking villagers tilling their fields in the valley below. The models aim to render faithfully the aspects of the environment they represent; their plasticity heightens the realistic effect. The models, which are enclosed in cases with a front panel of glass, are small in size, some three feet wide by two feet high, the human figures being about five or six inches high. They were executed by Mr. Dwight Franklin, who has made several collecting trips for the American Museum of Natural History.

Personal

Professor J. W. Bews of Natal University College, Maritzburg, read a paper entitled "An Account of the Chief Types of Vegetation in South Africa, with Notes on the Plant Succession" at the fourteenth annual meeting of the South African Association for the Advancement of Science, held at Maritzburg from July 3 to 8.

Dr. Henry J. Cox of Chicago spent the month of July in the orchard regions of the mountain slopes of western North Carolina, inspecting the special meteorological stations that are reporting the temperature, humidity, and rainfall conditions in connection with a five-year research which closes at the end of this year. Doctor Cox has charge of the project for the Weather Bureau, and the work is being done in co-operation with the State Board of Agriculture of North Carolina.

Dr. Alberto Edwards has succeeded to the directorship of the Oficina Central de Estadística of Chile on the death in Santiago on June 28 of the preceding director, Don Valentín del Campo.

Dr. Carlos Curt Hosseus, late inspector of agricultural engineering of the Argentine Department of Agriculture, spoke on June 30 before the Academy of Sciences of Buenos Aires on that part of the Argentine Andes lying to the west of the Nevado de Famatina in the provinces of La Rioja and San Juan, Argentina. Doctor Hosseus has recently been elected a member of the Academy of Sciences of Córdoba, Argentina.

Mr. Herbert Lang of the American Museum of Natural History gave a lecture on "The Faunal Relations of Central Africa" before the New York Academy of Sciences on October 9.

Professor B. E. Livingston and Dr. H. E. Pulling, of the laboratory of plant physiology of Johns Hopkins University, spent August and September in making an ecological reconnaissance of the region north of the new Hudson Bay Railway, in northern Manitoba. Their studies extended from Pickitonay (mile 187 from The Pas) down the series of rivers and lakes leading to the Nelson River below the grand rapid, thence down the Nelson to Split Lake and across the latter to its northern shore, thence back up the Nelson to the Manitou rapid (mile 214 from The Pas).

Mr. Stephen T. Mather, secretary to Franklin K. Lane, Secretary of the Interior, spoke on "Our National Parks" at the post-vacation luncheon of the Geographic Society of Chicago on October 28.

Mr. F. E. Matthes of the U. S. Geological Survey has recently returned from California, where he devoted the summer to a comparative study of the Hetch Hetchy and Yosemite Valleys.

Professor B. L. Miller of Lehigh University read a paper on "Geological Observations in the Andes of Peru and Bolivia" before the New York Academy of Sciences on October 16.

Mr. W. B. Nelson of the Brooklyn Manual Training High School will give a course in physiography in the School of Pedagogy, a university extension department, of the Brooklyn Institute of Arts and Sciences. The course will consist of thirty sessions of one hour each, with an occasional half hour of laboratory work, on Wednesday afternoons at 4.15, beginning on October 4, at the Brooklyn Academy of Music.

Professor George E. Nichols of the botanical department of Yale University spent the month of August on ecological investigations in northern Cape Breton Island.

Professors Heinrich Ries and R. E. Somers of the department of geology of Cornell University were engaged during the past summer in continuing their investigation of the clay deposits of Virginia for the Virginia Geological Survey.

Dr. Rudolph R. Schuller, who has recently been investigating South American manuscripts in the library of Northwestern University, has discovered a large unknown tract on the language of the Moseten Indians of northeastern Bolivia. The author of the work was an Italian Franciscan missionary, named Benigno Biboitti. The manuscript consists of 85 large folio pages containing a vocabulary of 2,500 words in

Moseten and Spanish, a grammatical essay and a religious treatise. Most remarkable of all is the fact that there are three discourses entirely in Moseten.

The Moseten language is one of the least known of the aboriginal idioms of Bolivia and the linguistical position of these Indians is still unknown. While a little has been previously published relating to this language, there has never been sufficient material to do very much, and hence this manuscript will be of the greatest aid in solving many perplexing questions relating to this branch of Indians.

Dr. Rudolph R. Schuller is an Austrian scholar who has spent perhaps twenty years of his life in South America. For a long time he was connected with the Museu Goeldi at Para in Brazil. Doctor Schuller is known for his edition of Félix de Azara's "Geografia Física y Esférica de las Provincias del Paraguay," published in Montevideo in 1904.

Mr. T. R. Sim of Pietermaritzburg read a paper on "Commercial Afforestation in South Africa" at the fourteenth annual meeting of the South African Association for the Advancement of Science held at Maritzburg from July 3 to 8.

Mr. Charles R. Toothaker, curator of the Philadelphia Museums, gave a lecture on the Danish West Indies before the Geographical Society of Philadelphia on November 1.

Obituary

Professor Cleveland Abbe, the dean of American meteorologists, died on October 28 at Chevy Chase, Md., at the age of 77. His early work was devoted to astronomy. In 1869, the year after his appointment as director of the Cincinnati Observatory, he suggested to the Chamber of Commerce of that city the desirability of collecting and comparing telegraphic weather reports from all parts of the country with a view to making forecasts. This proposition was accepted, and on September 1 he began the publication of daily weather reports. The project was received with such favor that it was brought to the attention of Congress, and on February 4, 1870, a meteorological service was established by joint resolution and put under the jurisdiction of the Chief Signal Officer of the army. The next year Abbe was appointed meteorologist of the Signal Service and in February began the publication of tri-daily reports and forecasts. For the first year he did in person the work of collating and tabulating, until competent assistants could be trained. In 1891 the Weather Bureau was created under the Department of Agriculture and became the official meteorological service of the government. From that date to his death Professor Abbe continued his connection with the Bureau. He was editor of the *Monthly Weather Review* from 1872 to 1915, when advancing years caused him to transfer his duties to his son, Cleveland Abbe, Jr., as acting editor. From 1909 to 1913 he was editor of the *Bulletin of the Mt. Weather Observatory*. Professor Abbe also occupied two academic positions, viz., as professor of meteorology at Columbian (now George Washington) University from 1886 to 1905 and as lecturer on meteorology at Johns Hopkins University from 1896 to 1914. The following are the most important among Professor Abbe's publications:

Report on Standard Time, 1879, which started the agitation that resulted in the modern standard hour meridians from Greenwich; Treatise on Meteorological Apparatus and Methods, *Appendix 46, Annual Rept. of Chief Signal Officer for 1887;* Preparatory Studies for Deductive Methods in Storm and Weather Prediction, *Appendix 15, Ann. Rept. Chief Signal Officer for 1889;* Short Memoirs on Meteorological Subjects [first collection of translations], *Ann. Rept. Smithsonian Institution for 1877,* pp. 376-478; The Mechanics of the Atmosphere, A Collection of Translations [second collection], *Smithsonian Misc. Coll. 843,* 1891; Third Collection, *Smithsonian Misc. Coll.,* Vol. 51, No. 4, 1910; A First Report on the Relations between Climates and Crops, *U. S. Weather Bureau Bull. 36,* 1905.

Captain Samuel W. Bartlett died on September 9 at Brigus, Newfoundland, his birthplace and lifelong home. Captain Bartlett had been master of the *Windward, Erik,* and other Peary auxiliary steamers, and later of the *Neptune* of the Canadian Government Expedition to Hudson Bay under Dr. A. P. Low in 1903-04.

Prince Boris Galitzin, director of the Meteorological Service of Russia since 1913 and professor of physics in the University of Petrograd, died May 4 at the age of 64. Prince Galitzin is best known for his work in seismology, particularly in the locating of earthquake epicenters from the records of a single station.

Professor Charles S. Prosser, head of the department of geology in the Ohio State University, died suddenly in Columbus on September 12 at the age of 56. Professor Prosser had been connected with the geological surveys of Kansas, New York, and Ohio.

GEOGRAPHICAL PUBLICATIONS

(Reviews and Titles of Books, Papers, and Maps)

For key to classification see "Explanatory Note" in the July number, pp. 77-81

NORTH AMERICA

United States

South-Central States

Haney, L. H., edit. **Studies in the industrial resources of Texas.** 105 pp.; maps, diagrs. *Bull. Univ. of Texas,* 1915, No. 3. Austin, 1915.

The detailed work on this bulletin was done largely by undergraduate students of the University of Texas. The principal topics treated are: soil belts, climate, population, crops, lumber, irrigation, railways, banks and the wealth of Texas. With so many topics, any intensive study is, of course, precluded in a pamphlet of about one

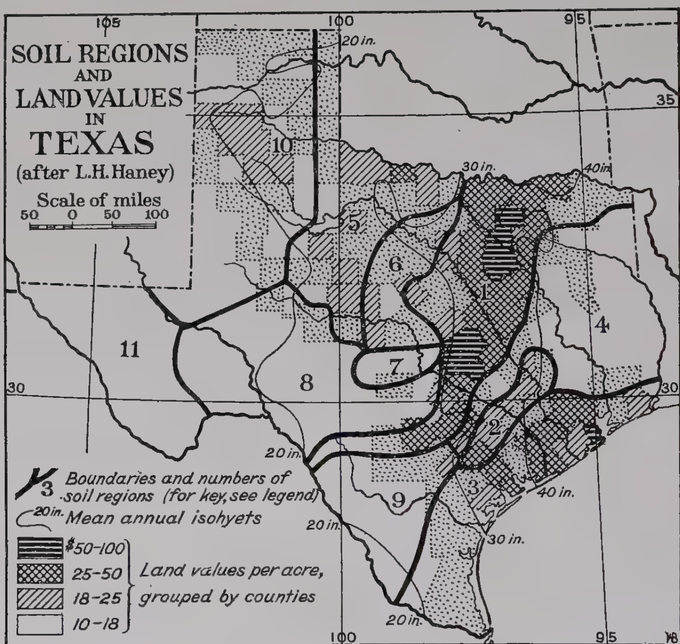

Fig. 1—Map of Texas showing the relation of land values to soil regions (after Fig. 1, *Bull. Univ. of Texas,* 1915, No. 3). Scale, 1:14,600,000.

1. Black land belt (Houston black clay).
2. Central Neocene area (black sandy loam).
3. Coast prairie (Houston black clay).
4. East Texas timber belt (sands and sandy loam).
5. Permian plains (red loam prairie soils).
6. Carboniferous area (sands and black clays, underlain by sandstone and conglomerates).
7. Llano country (granitic sand, Crawford black clay, and fine red sandy soil).
8. Edwards plateau (Crawford stony clay and red-brown soil of limestone derivation).
9. Tertiary southwest (brown sands and sandy loams, and brown and black clays).
10. Staked Plains (fine sandy loams, etc.).
11. Trans-Pecos area (brown sandy loams).

hundred pages. Yet the bulletin will be of interest to the people of the state who wish a bird's-eye view of its economic problems, and the numerous correlations of life with earth factors make it of value to geographers.

Ten soil provinces are named and mapped (see adjoining map, which should be compared with R. H. Loughbridge's map of the agricultural divisions of the state in the

Tenth Census (for 1880) reports, Vol. 5, opp. p. 671, and R. T. Hill's map of the physiographic provinces of Texas, Pl. 1, *U. S. Geol. Surv. 21st Annual Rept.* (*for 1899-1900*), Part VII, and Fig. 1, *U. S. Geol. Surv. Topogr. Folio No. 3*). Of the soil provinces the "black belt," which is continued in Mississippi and Alabama, is the most productive and shows the highest yields of cotton and corn, the leading crops of the state. Several climatic maps are given which illustrate the great climatic diversity of the state. No county having an average land value of over $18 per acre lies west of the 20-inch rainfall line. The long growing season and the moisture in the humid region are some factors that account for the high cotton production of Texas. The timber growth varies from the cypress of the humid and hot eastern country to the cactus of the arid western part, and the timber belts roughly reflect the rainfall. Irrigation shows two responses: the low-lying rice fields of the southeastern section, and the irrigation to supply an absence of rainfall in the dry section. F. V. EMERSON.

—— **Houston, Texas, Development of inland ocean port at.** Map, diagrs., ills. *Engineering News*, Vol. 75, 1916, No. 21, pp. 978-980.

WEGEMANN, C. H. **A reconnaissance in Palo Pinto County, Texas, with special reference to oil and gas.** Map. *U. S. Geol. Surv. Bull. 621-E*, pp. 51-59. Washington, 1916.

Western States

AYER, MRS. E. E., transl. **The memorial of Fray Alonso de Benavides, 1630.** Annotated by F. W. Hodge and C. F. Lummis. xiii and 309 pp.; ills., index. Privately printed, Chicago, 1916. $10.00. 9½ x 6½.

The early archives of Spain in the Indies are rich in material of geographic value, but it is seldom available in such illuminated and attractive guise as in this volume. The original text of Benavides' precious memorial is accompanied by a remarkably faithful translation, annotated with care and detail. Admirable photographic illustrations vivify the narrative. The only criticism of the outlay of the book is one that must naturally occur to the geographer: the lack of any form of map for an area where location plays an important part.

Benavides was one of the pioneer missioners of New Mexico. Together with twenty-six friars he entered the province assigned him as Father Custodian in 1622. He himself devoted attention principally to the Apache of the Upper Gila region, and the most detailed section of his memorial naturally pertains to this "huge nation." More briefly the memorial describes the other nations of the old "kingdom" of New Mexico that began north of Santa Barbara in Chihuahua and gives a general account of the character of the territory, "the fertility of the land," "fish," "game," "rigor of the temperature." In the concluding portion of the narration Benavides advances a plan of considerable geographic interest, viz., the advisability of creating a port in Matagorda Bay (Espíritu Santo) as terminal for a new route to obviate the long and difficult overland journey from New Spain. Half a century later foreign aggressions in the Gulf of Mexico led to active interest in the proposal.

The importance of the memorial was recognized from the moment of its appearance. Within four years after its publication in 1630 it was translated into four other languages. Of recent years the work has appeared in modernized Spanish form, and two English translations, one of them incomplete, have been produced in this country.

REED, W. G. **Report of the meteorological station at Berkeley, California, for the year ending June 30, 1914.** Maps, diagrs., ills. *Univ. of California Publs. in Geogr.*, Vol. 1, 1916, No. 9, pp. 373-439.

REED, W. G., AND M. K. WHITE. **Rainfall data of Berkeley, California, II.** Diagrs. *Univ. of California Publs. in Engin.*, Vol. 1, 1916, No. 6, pp. 83-116.

What one enthusiastic and competent meteorologist can do with what are often considered "dry" meteorological data has been well illustrated during the past few years by the publications of Mr. William G. Reed, until lately of the University of California. The clean-cut, systematic, and above all *interesting* report of the Berkeley meteorological station during the year ending June 30, 1914, comes as a refreshing relief among the many voluminous tabulations of meteorological data which form a large part of every meteorologist's mail and which are in so many cases mere numerical data, without life, without real interest, without discussion. The Berkeley report is an excellent presentation of effective meteorological work, well done. In addition to the routine observations, a special study has been made of frost conditions in Berkeley and of other matters of local interest. Several diagrams emphasize the more important meteorological facts. We note, with special satisfaction, Mr. Reed's study of rainfall by cyclones, which seems to

us an essential element in any compilation and discussion of rainfall data, especially in extra-tropical countries. A selected series of simplified maps illustrates the cyclonic conditions which determined the rainfall at Berkeley in nine cases.

The second publication, on the rainfall data of Berkeley, supplements an earlier discussion by Mr. Reed, published in 1915 (*Univ. of California Publs. in Engin.*, Vol. 1, No. 5). The former report deals with the rainfall observations made by the University of California as a co-operative observing station of the U. S. Weather Bureau. The second report summarizes the data obtained from the recording rain-gage maintained by the Department of Civil Engineering since 1911 and deals with rain intensity. Diagrams are given showing a comparison of various intensity curves which have been proposed for the vicinity of San Francisco and for the severity of a storm that may reasonably be expected to occur once in five years, once a year, twice a year, and four times a year. Such data are obviously of great importance to engineers as well as to meteorologists. It may be noted that Mr. Reed has given a summary of the two publications on the rainfall data of Berkeley in the *Monthly Weather Review* for March, 1916, pp. 123-127. R. DeC. Ward.

Alden, W. C. **Glaciers of Glacier National Park.** 48 pp.; maps, diagrs., ills. Dept. of the Interior, Washington, D. C., 1914.

Allen, G. F. **The forests of Mount Rainier National Park.** 33 pp.; ills., index. Dept. of the Interior, Washington, D. C., 1916. [A splendidly illustrated contribution to a series whose admirable treatment might with advantage be extended to geographic regions. The full description of the floristic characters of the National Parks will prove valuable to scientist as well as tourist.]

Bagley, C. B., edit. **Journal of occurrences at Nisqually House, 1833.** *Washington Hist. Quart.*, Vol. 6, 1915, No. 3, pp. 179-197; No. 4, pp. 264-278; Vol. 7, 1916, No. 1, pp. 59-75; No. 2, pp. 144-167. Seattle. [First publication of a daily record kept at a subsidiary post of the Hudson Bay Company on Puget Sound from 1833 to 1869. The first instalment has already been listed in the *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, p. 895.]

Bastin, E. S., and J. M. Hill. **Preliminary report on the economic geology of Gilpin County, Colorado.** Maps, diagr., ills. *U. S. Geol. Surv. Bull. 620-M*, pp. 295-323. Washington, 1916.

Bradley, W. C., G. C. Brown, F. L. Lowell, and R. P. McLaughlin. **Mines and mineral resources of the counties of Fresno, Kern, Kings, Madera, Mariposa, Merced, San Joaquin, and Stanislaus.** 220 pp.; diagrs., ills., index, bibliogr. From *Rept. of State Mineralogist, 1913-1914.* California State Mining Bur., San Francisco, 1915.

Bradley, W. W. **Mines and mineral resources of the counties of Colusa, Glenn, Lake, Marin, Napa, Solano, Sonoma, Yolo.** 208 pp.; map, diagrs., ills., index, bibliogr. From *Rept. of State Mineralogist, 1913-1914.* California State Mining Bur., San Francisco, 1915.

—— **Bridge washouts in the desert.** Ills. *Engineering News*, Vol. 75, 1916, No. 19, pp. 873-874.

Brown, G. C. **Mines and mineral resources of Shasta County, Siskiyou County, and Trinity County.** 192 pp.; diagrs., ills., index, bibliogr. From *Rept. of State Mineralogist, 1913-1914.* California State Mining Bur., San Francisco, 1915.

Butman, C. H. **The Sun Temple in Mesa Verde Park.** Ills. *Scientific American Suppl.*, No. 2106, Vol. 81, 1916, May 13, pp. 312-313.

—— **Caliche roads: A new type of construction in Arizona.** Ills. *Engineering News*, Vol. 75, 1916, No. 18, p. 532.

Camp, C. L. **Notes on the local distribution and habits of the amphibians and reptiles of southeastern California in the vicinity of the Turtle Mountains.** Map, ills. *Univ. of California Publs. in Zoöl.*, Vol. 12, 1916, No. 17, pp. 503-544. ["The Turtle Mountain work was undertaken for the purpose of studying a definite fauna in an arid locality, where animal habitats are reduced nearly to simple topographical terms."]

Cannon, Miles. **Fort Hall on the Saptin River.** *Washington Hist. Quart.*, Vol. 7, 1916, No. 3, pp. 217-232. [Early fort on the upper Snake River near present Pocatello, Idaho.]

Jones, O. M. **Bibliography of Colorado geology and mining, with subject index from the earliest explorations to 1912.** 493 pp.; index. *Colorado State Geol. Surv. Bull. 7.* Denver, 1914.

LOWELL, F. L. **Mines and mineral resources of Del Norte County, Humboldt County, and Mendocino County.** 59 pp.; maps, diagrs., ills., index. From *Rept. of State Mineralogist, 1913-1914.* California State Mining Bur., San Francisco, 1915.

LUPTON, C. T. **Oil and gas near Basin, Big Horn County, Wyoming.** Maps. *U. S. Geol. Surv. Bull. 621-L,* pp. 157-190. Washington, 1916.

MARTIN, BRUCE. **The Pliocene of middle and northern California.** *Univ. of California Publ. Bull. Dept. of Geol.,* Vol. 9, 1916, No. 9, pp. 215-259.

—— **National Park Conference held at Berkeley, California, March 11, 12, and 13, 1915, Proceedings of the.** 166 pp.; diagrs. Dept. of the Interior, Washington, 1915.

REED, W. G. **Rainfall data of Berkeley, Cal.** Diagrs. *Monthly Weather Rev.,* Vol. 44, 1916, No. 3, pp. 123-127. [See comment at end of review above under Reed, W. G.]

SULLY, J. M. **The story of the Santa Rita copper mine.** Ills. *Old Santa Fe,* Vol. 3, 1916, No. 10, pp. 132-149. Santa Fe, N. M. [The discovery of the Santa Rita mines in 1800 "marks the beginning in history of an industry which has raised the state of New Mexico from the bottom of the list in 1910 to sixth place in point of copper production among all the states of the Union."]

SYKES, GODFREY. **The reclamation of a desert.** Map, ills. *Geogr. Journ.,* Vol. 46, 1915, No. 6, pp. 447-457. [Salton Sink region. Contains account of overflow of Colorado River in 1905.]

TUCKER, W. B. **Mines and mineral resources of Amador County, Calaveras County, and Tuolumne County.** 180 pp.; diagrs., ills., index. From *Rept. of State Mineralogist, 1913-1914.* California State Mining Bur., San Francisco, 1915.

YOUNG, R. F. **Relation of precipitation to stream flow in Montana.** Map. *Monthly Weather Rev.,* Vol. 44, 1916, No. 2, pp. 84-86.

(1) ***Cooperstown,*** (2) ***Montpellier,*** (3) ***Oakdale,*** (4) ***Paulsell,*** (5) ***Trigo, California, sheets.*** [***Topographic map of the United States.***] 1:31,680. Surveyed in 1913; editions of 1915 and 1916. U. S. Geological Survey, Washington, D. C. [Examples of maturely dissected, fine-textured portions of the floor of the Great Valley of California bordering lower courses of Stanislaus and Tuolumne Rivers. Among special features well represented are river terraces; a typical complicated shore-line of submergence where the waters of an artificial reservoir have invaded the branching ravines between the close-set hills (Paulsell sheet); and meandering arroyos of striking form.—D. W. J.]

(1) ***Ripon,*** (2) ***Thalheim,*** (3) ***Westley,*** (4) ***Westport, California, sheets.*** [***Topographic map of the United States.***] 1:31,680. Surveyed in 1913; editions of Sept. and Oct., 1915. U. S. Geological Survey, Washington, D. C. [Typical example of meandering courses of the Stanislaus, Tuolumne, and San Joaquin Rivers on the flat floor of little-dissected portions of the Great Valley of California. Good river terraces are well shown on the Thalheim and Westport sheets, while the Westley and Westport sheets include admirable representations of the complicated meanders and cut-offs found along the lower San Joaquin.—D. W. J.]

MEXICO AND CENTRAL AMERICA

MACDONALD, D. F. **Some engineering problems of the Panama Canal in their relation to geology and topography.** 88 pp.; maps, diagrs., ills., index, bibliogr. *Bur. of Mines Bull. 86.* Dept. of the Interior, Washington, 1915.

This report aims to discuss, from the viewpoint of the mining geologist, the bearing of topographic and geologic conditions on certain problems that arose in the construction of the Panama Canal. It is in other words a discussion of the engineering geology.

The author points out clearly how important it is for the engineer to know the distribution and structure of the different rock types, in the area of his work, because of their bearing on excavation cost and methods, stability of dam and lock foundations, etc.

He therefore takes up first briefly the topography, climate, and drainage conditions, pointing out the bearing of each on this particular problem. This is followed by an account of the geology and especially the relation of each formation to the work of canal construction. The rocks are all of Tertiary or Pleistocene age, but include both igneous and sedimentary areas, and many are much disintegrated by weathering, so that they wash and slide easily.

This leads to a consideration of the sources of materials for constructor's work along the canal, and we see that these ranged from soft mud used for filling swamps or spaces between loose stone to hard igneous rock employed for concrete. The rock formations on

which the large Gatun Dam and the locks were built are given special attention and are shown to be safe.

A considerable portion of the bulletin, however, is given up to a most interesting discussion of the slides in the great Culebra cut, in connection with which the author analyzes in much detail the conditions causing slides and gives a table showing the safe angle of slope for different kinds of rock and structure. The Culebra slides were of four distinct types, the author believes, and he classifies them as: (1) structural breaks and deformations; (2) normal, or gravity, slides; (3) fault-zone slides; and (4) surface erosion. In all cases, no doubt, ground water played an important rôle in softening the rock and lowering its coherence.

The maintenance of a geologist at the Panama Canal, as on the Catskill aqueduct, shows that the engineer is coming to recognize that in great undertakings of this sort a knowledge of earth science is important. H. Ries.

Arosemena, J. D., edit. **Panamá en 1915.** 219 pp.; maps, diagrs., ills. Morales & Rodriguez, [Panama]. 15 x 10½. [Contains chapters on the history of Panama, the Canal, and on recent progress in social and industrial affairs; also a gazetteer of the constituent provinces. The greater number of the articles appear both in Spanish and English.]

Arreola, J. M. **Catálogo de las erupciones antiguas del volcán de Colima.** *Mem. y Rev. de la Soc. Cientifica "Antonio Alzate,"* Vol. 32, 1915, No. 11-12, pp. 443-481. Mexico.

Boyle, W. F. **Puerto Cortes, [Honduras].** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 31a, pp. 10-12. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

—— **Canale di Panama, Commercio centro-americano attraverso il.** *Rapporti dei RR. Agenti diplomatici e consolari N. 24*, pp. 4-5. Direz. Gen. degli Affari Comm., Minist. degli Affari Esteri, Rome, December, 1915.

—— **Costa Rica, República de: Anuario Estadístico, Vol. 10, Año 1914.** 139 pp.; index. San Jose, 1915. [The population of Costa Rica is given as 420,179 on Dec. 31, 1914. No census has been taken since 1892, and these figures are based on the increase indicated by the returns for births and deaths, election registration, etc.]

De Launay, L. **L'industrie au Mexique.** Ills. *La Nature*, No. 2232, 1916, July 8, pp. 17-21.

Dyer, F. J. **Ceiba.** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 31a, pp. 5-9. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C. ["Ceiba consular district embraces the richest agricultural section of Honduras."]

Maudslay, A. P. **The valley of Mexico.** Map, ills. *Geogr. Journ.*, Vol. 48, 1916, No. 1, pp. 11-23.

Notari, —. **Alcuni dati sul commercio della republica di Guatemala.** 25 pp. (*Boll. della*) *Direz. Gen. degli Affari Commerciali*, 1916, No. 1. Minist. degli Affari Esteri, Rome.

Pizarro, M. T. **Cantidad de agua caida en la hacienda de Acozac, Municipalidad de Yxtapaluca, Distrito de Chalco, Estado de México, durante un periodo de 20 años, contados desde 1894 a 1913.** *Mem. y Rev. de la Soc. Cientifica "Antonio Alzate,"* Vol. 32, 1915, No. 11-12, facing p. 508. Mexico. [A graph.]

Sandberg, H. O. **Ancient temples and cities of the New World: Tikal [Guatemala].** Map, diagrs., ills. *Bull. Pan American Union*, Vol. 43, 1916, No. 3, pp. 319-337.

Sandberg, H. O. **Central America of today: Costa Rica.** Ills. *Bull. Pan American Union*, Vol. 42, 1916, No. 5, pp. 605-625.

Sandberg, H. O. **Central America of today: Honduras.** Ills. *Bull. Pan American Union*, Vol. 42, 1916, No. 1, pp. 32-52.

Townsend, C. H. **Voyage of the "Albatross" to the Gulf of California in 1911. (Scientific results of the expedition to the Gulf of California in charge of C. H. Townsend, by the U. S. Fisheries steamship "Albatross" in 1911, Commander G. H. Burrage, U. S. N., commanding: I).** Map, ills. *Bull. Amer. Museum of Nat. Hist.*, Vol. 35, 1916, Art. 24, pp. 399-476. [The expedition was undertaken in March and April, 1911, in co-operation with the U. S. Bureau of Fisheries by the American Museum of Natural History, the New York Zoölogical Society, the New York Botanical Garden, and the U. S. National Museum. "The Bureau of Fisheries desired information respecting the fish and fisheries and the oceanographical features of Lower California and the Gulf region, referring especially to the desirability of further knowledge regarding the

supply of edible fishes, oysters, and turtles, with a view to inaugurating a fish trade within the Southwestern states." The present publication contains the narrative account. The hydrographic observations included 27 soundings, which are enumerated, with complete data, in Appendix C (pp. 462-475) and shown in the map, 1:5,000,000, accompanying the report.]

WAITZ, PAUL. **"Absteigende Eruptionswolken" bei den Ausbrüchen des Jorullo (1759) und des Ceboruco (1870) in Mexiko.** *Zeitschr. für Vulkanologie,* Vol. 2, 1915, No. 1-2, pp. 76-82.

WILKINSON, S. L. **Honduras.** *Suppl. to Commerce Repts.,* Ann. Series, 1916, No. 31a, pp. 1-5, Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

WITTICH, ERNESTO. **Las salinas de Ojo de Liebre en la bahía de Sebastián Vizcaino, B[aja] C[alifornia].** *Bol. Minero,* Vol. 2, 1916, No. 5, pp. 235-240. Direcc. de Minas y Petróleo, Depart. de Minas, Secr. de Fomento, Colon. e Industr., Mexico. [The observations on these deposits were made during an expedition to Lower California in 1911-12.]

WEST INDIES

ALFONSO, M. F., AND T. V. MARTINEZ. **Cuba before the world.** 223 pp.; diagrs., ills. The Souvenir Guide of Cuba Co., New York, 1915. $2.00. 11 x 8. [Chiefly a popular book for tourist use but containing some valuable geographical description and statistics not found elsewhere.]

BENJAMINS, H. D., AND J. F. SNELLEMAN, edits. **Encyclopædie van Nederlandsch West-Indië, Afl. 8:** pp. 449-512. Martinus Nijhoff, The Hague; N. V. Boekh. en Drukkerij (voorheen E. J. Brill), Leiden, 1914. Fl. 2. 10½ x 7½. [Deals with all Dutch possessions in the western hemisphere. Of geographical interest in this instalment are the long entries on the Maroni and Nickerie, two of the larger rivers of Dutch Guiana. The work will be completed in ten to fifteen instalments.]

CARROLL, H. K. **Conditions in Porto Rico at the beginning of the American occupation.** *Rept. of the 33rd Ann. Lake Mohonk Conference on the Indian and other Dependent Peoples, Oct. 20, 21, and 22, 1915,* pp. 139-140.

—— **Cayman Islands (Jamaica): Report for 1914-15.** 13 pp.; map. *Ann. Colonial Repts. No. 879.* London, 1916.

CRAMPTON, H. E. **Porto Rico.** Ills. *American Museum Journ.,* Vol. 16, 1916, No. 1, pp. 59-70.

DOMINGUEZ, J. V. **The language problem [in Porto Rico] and political relations with the United States.** *Rept. of the 33rd Ann. Lake Mohonk Conference on the Indian and other Dependent Peoples, Oct. 20, 21, and 22, 1915,* pp. 161-166.

EASTMAN, C. R. **The Reversus, a fishing tale of Christopher Columbus.** Ills. *Scientific Monthly,* Vol. 3, 1916, No. 1, pp. 31-40. [On fishing with the *Remora,* a sucking fish which attaches itself to its captive, as witnessed by Columbus near Cuba on his voyage of 1494.]

ENGELHARDT, G. P. **The Bahamas, coral reefs and coral islands. Ills.** *Brooklyn Museum Quart.,* Vol. 1, 1915, No. 4, pp. 201-215.

HAZARD, D. L. **Results of observations made at the United States Coast and Geodetic Survey magnetic observatory at Vieques, Porto Rico, 1913 and 1914.** 102 pp.; diagrs. *U. S. Coast and Geod. Surv. Ser. No. 33.* Washington, D. C., 1916.

MACDERMOT, T. H. **The King's dominion of the islands: Major and minor West Indian notes.** *United Empire,* Vol. 7 (New Series), 1916, No. 3, pp. 207-211; No. 4, pp. 271-276.

MAY, D. W. **Agricultural interests and prospects of Porto Rico.** *Rept. of the 33rd Ann. Lake Mohonk Conference on the Indian and other Dependent Peoples, Oct. 20, 21, and 22, 1915,* pp. 140-145.

MURRAY, GIDEON. **St. Lucia: Report for 1914-15.** 12 pp. *Ann. Colonial Repts. No. 880.* London, 1916.

STODDARD, T. L. **The Danish West Indies: Keys to the Caribbean.** Map. *Amer. Review of Reviews,* Vol. 54, 1916, No. 3, pp. 292-298.

WETMORE, ALEXANDER. **Birds of Porto Rico.** 140 pp.; map, ills., index, bibliogr. *U. S. Dept. of Agric. Bull. No. 326.* Washington, 1916. [A determination of the economic status of the island birds. Damage to crops by insect pests led to the investigation into the relations between the air fauna and insect fauna.]

YAGER, ARTHUR. **Fundamental social and political problems of Porto Rico.** *Rept of the 33rd Ann. Lake Mohonk Conference on the Indian and other Dependent Peoples, Oct. 20, 21, and 22, 1915,* pp. 145-153. [Abstracted in the March *Review,* pp. 211-212.]

SOUTH AMERICA

BRAZIL

KOEGEL, LUDWIG. **Das Urwaldphänomen Amazoniens: Eine geographische Studie.** xx and 83 pp.; map, bibliogr. J. Lindauersche Univ.-Buchhandlung, München, 1914. M. 2. 9 x 6.

An account of the forest region of the Amazon lowland (''Amazonia'') from the standpoint of the geographer. The area treated, embracing a large portion of northern Brazil, together with adjoining parts of Venezuela, Colombia, Ecuador, Peru, and Bolivia, and representing the most extensive tropical lowland on the earth, is one of great physical uniformity. Taken as a whole the surface is practically horizontal, as may be seen from the comparatively low elevations recorded at many points along its western border—e. g. 180 meters at Pongo de Manseriche, more than 3200 kilometers from the mouth of the Amazon. Examined in detail the surface appears roughened, but is nowhere broken by pronounced orographic features. The characteristic type of vegetation is tropical rain-forest.

This lowland forest region stretches from the mouth of the Amazon, with whose drainage basin it is so intimately associated, westward to the foot of the Andes. Its boundaries, as indicated on the excellent accompanying map in 1:7,500,000 and discussed in great detail in the text, are somewhat as follows. In the east, the first large rivers to reach the ocean north and south respectively of the mouth of the Amazon (the Oyapock and the Gurupy) are regarded as separating the Amazon lowland from the adjoining, and floristically similar, coastal lowlands. Toward the north, from the headwaters of the Oyapock westward to Peak F. de Lesseps, mountain ranges for the most part form a natural boundary. From this point to the base of the Andes the line is roughly traced along the courses of the Orinoco and Guaviare Rivers. Here, in the absence of any delimiting physiographic features, vegetational dissimilarities—the distribution of forest and *campo*—are largely employed as criteria in fixing upon the probable limits of the Amazon lowland. Toward the west the lowland forests give way to the mountain forests which clothe the Cordilleran foothills. The transition between the two types of forest is rarely abrupt, and some of the most characteristic lowland species, e. g. the rubber tree (*Hevea braziliensis*), locally extend far into the mountain area; but the five-hundred-meter isohypse is more or less arbitrarily selected as marking the upper limit of the lowland. Toward the south the boundary between the Amazon lowland and the highlands of central Brazil is not sharply defined; the line is drawn through the zone of the lower waterfalls and stream sources of the southern tributaries of the Amazon. Here again, as in the northwest, the limits of the lowland are taken to coincide with the distribution of the forests, these being superseded southward by *campos.*

As already stated, the characteristic plant formation of the Amazon lowland, taken as a whole, is tropical rain-forest. Yet the physiognomy of the vegetation is not uniform throughout, and particular stress is laid on certain significant dissimilarities. Toward the west luxuriant forests hold undisputed domain, but in the east the forest at its best is less luxuriant than in the west. Furthermore, scattered island-like throughout the eastern section are extensive *campos* (*''Campinseln''*). These vegetational dissimilarities between east and west are attributed partly to climatic, partly to edaphic factors. Eastward there is a more or less pronounced dry season, while the nature of the substratum and the ground-water relations are such that the level of the water-table fluctuates markedly according to the amount of rainfall. Westward the precipitation appears to be more equally distributed throughout the year, while the interrelation of the various soil conditions is such that the level of the water-table remains more constant and is less affected by seasonal variations in rainfall.

The author's observations and conclusions are based on the examination of all available published data, supplemented by personal correspondence with various contemporary investigators. By no means the least valuable part of the work is a bibliography of the maps and literature dealing with the region, containing more than four hundred titles. As the first comprehensive account of the Amazon lowland in its entirety, this paper, together with its excellent map (which was reviewed in the *Bull. Amer. Geogr. Soc.,* Vol. 47, 1915, pp. 476-477, at the time of its publication in *Petermanns Mitteilungen* with a summary of the present paper), represents a noteworthy contribution to geographical literature.

GEORGE E. NICHOLS.

—— **Bahia cacao industry, The.** *South American Journ.*, Vol. 81, 1916, No. 3, pp. 49-50.

Dickie, (Consul). **Report for the year 1914 on the trade of the consular district of Pernambuco.** 26 pp.; map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5565. London, 1916.

Elliott, L. E. **Old and new São Paulo: The rise of a business city.** Ills. *Pan-American Mag.*, Vol. 22, 1916, No. 5, pp. 295-308. New York.

Keiser, R. L. **Rio Grande Do Sul.** 11 pp. *Suppl. to Commerce Repts.*, Ann. Series, No. 40a. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

Morize, H. **The geographic and magnetic survey of the southern part of Brazil.** *Terrestr. Magnet. and Atmosph. Electr.*, Vol. 21, 1916, No. 1, pp. 23-24.

Paraguay, Uruguay, Argentina, Chile

—— **Argentine Year Book, The: Tenth edition, 1915-1916.** With short chapters on the Republics of Uruguay, Paraguay, and Chile. xxxii and 406 pp. Robert Grant & Co., Buenos Aires; American agents: Donnell & Palmer, New York, [1916]. 8½ x 5½.

This appears to be a very well compiled handbook. Its contents are compact and accessible. The comparative tables of economic data are particularly useful. One may instance that for the disposition of rural property holdings for 1902 and 1912. Here is shown in concrete form one of the most significant features of recent progress in Argentina, the reduction of the great latifundia. During the ten-year period quoted the number of holdings in the province of Buenos Aires increased by over 50 per cent, the increase being chiefly in the small properties of 10 to 100 hectares at the expense of the estates of over 5,000 hectares. Like changes occurred in Córdoba and Santa Fé. In Pampa Central, the great new field of Argentine expansion, the 624 estates of over 10,000 hectares in 1902 were reduced to 172, while the holdings of 10 to 100 hectares grew from 243 to 3,180.

—— **Chile, Anuario Hidrográfico de la Marina de, 1915: Tomo 29.** viii and 439 pp.; maps, diagrs., index. Valparaiso, 1915.

The most important part of this, the 29th annual volume of the Chilean Hydrographic Survey, pertains to studies made along the West Patagonian coast in 1912, accompanied by numerous charts. Valuable geographic material is scattered throughout. Much meteorological material was accumulated: in particular there is a useful description of weather in the northern islands of the Magallanes Territory. At Navarino, one of the islands of the Beagle Channel, exceptionally interesting information was acquired from an Austrian colonist who had resided there for a period of sixteen years. According to this informant the mean temperature of the islands south of Tierra del Fuego is much higher than that of Punta Arenas. In summer "suffocating" heat is experienced, and prolonged drought is frequent, as, for instance, obtained during 1910-11 and caused serious harm to the pastures. During the last seven years of the period covered by this report precipitation appeared to have diminished. The number of rainy days ranged from 100 to 150 per annum. The climate is well suited to sheep farming, the chief resource of the settlers. Their flocks are estimated at about 13,000 head, with 500 cattle. Products are disposed of in the Argentine town of Ushuaia on the mainland. Horticulture flourishes, though, for lack of a market, it is only developed for local needs.

One of the surveys carried out in 1910 briefly reports the progress of the Sociedad Industrial del Aysen. The company, located in the Aysen basin about 45° S. latitude, possesses two *estancias* and in 1910 estimated their sheep at 80,000 head, cattle at 10,000. Most of their employees are drawn from Llanquihue and Chiloé, but there are also a dozen English families contracted for a period of years. The company's main business is done in wool, of which in 1909 about 370,000 pounds were forwarded to Valparaiso. Cattle are also exported to the north, but they go by road. The land journey necessitates entry into Argentine territory, and, as no Chilean custom house exists in this remote region, duty has to be paid on re-entry into the country. This annoyance has led to the export of much of the poorer stock in the form of dried beef, *charqui.*

—— **Aconcagua, The first winter ascent of the.** Ills. *Bull. Pan American Union*, Vol. 42, 1916, No. 2, pp. 250-255. [This ascent of the "Giant of the Western World"—Aconcagua has an elevation of 23,000 feet—was undertaken in September, 1915. The summit ridge was reached, but an ice wall prevented the scaling of the last 200 feet to

the actual summit. The mountain has been ascended on four previous occasions, for the first time in 1897. The account is taken from an article by Eilert Lundt in a recent number of *The Standard* of Buenos Aires. The *South American Journal* (Vol. 81, No. 10, 1916) also publishes an account from a report in the *South Pacific Mail.*]

—— **Argentina's fuel problem serious.** *The South American,* Vol. 4, 1916, No. 7, p. 163. New York.

Barnabé, J. F. **Informe sobre el distrito minero de Tinogasta (Provincia de Catamarca).** 58 pp.; maps, diagrs., ills. *Anales del Minist. de Agric.: Sección Geol., Mineral. y Minería,* Vol. 10, 1915, No. 4. Buenos Aires. [See note on the "Mineral Resources of Argentina" in the July *Review,* p. 62.]

Barnabé, J. F. **Los yacimientos minerales de la Puna de Atacama.** 63 pp.; diagrs., ill. *Anales del Minist. de Agric.: Seccion Geol., Mineral. y Minería,* Vol. 10, 1915, No. 5. Buenos Aires. [Accompanied by a map of the Puna de Atacama which shows many details not hitherto found on maps of the region. While the photographic reproductions are poor, the subjects are well chosen and give an adequate idea of the types of country. The explanations are least satisfactory and rest upon purely empirical descriptions and opinions. The text is important chiefly because of its up-to-date information on the state of the mines of the Puna.]

——**Buenos Aires, Anuario Estadístico de la Ciudad de: [Vol.] 24, 1914.** 326 pp. Dirección General de Estadística Municipal, Buenos Aires, 1915.

Calvert, J. S. **Argentina.** 16 pp. *Suppl. to Commerce Repts.,* Ann. Series, 1916, No. 38b. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

—— **Chile, Anuario Meteorológico de: Segunda parte (Resúmenes), 1913.** 134 pp.; map, diagrs., ills. *Inst. Central Meteorol. y Geofísico de Chile* [*Publ.*] *No. 15.* Santiago, Chile, 1915.

Condell, C. F. **Falkland Islands: Report for 1914.** 13 pp.; map. *Ann. Colon. Repts. No. 872.* London, 1916.

Dickson, J. Q. **The Empire's outpost in the South Atlantic.** Ills. *United Empire,* Vol. 7, N. S., 1916, No. 2, pp. 161-172. [The sheep industry of the Falklands and the whaling of South Georgia are described in some detail.]

Elliott, L. E., and W. W. Rasor. **Meat export from the Argentine.** Ills. *Pan-American Mag.,* Vol. 22, 1916, No. 5, pp. 309-325. New York.

Gancedo (hijo), Alejandro. **Organización política de los Diaguitas.** Ills. *Anales del Museo Nacional de Hist. Nat. de Buenos Aires,* Vol. 27, 1915, pp. 335-352. Buenos Aires. [In the hunt of the jaguar originated the insignia symbolic of the despotic organization of the Diaguitas. These tribes occupy the mountainous territory of Argentina from the valley of Lerma to Mendoza, with the exception of the Sierra de Córdoba. They are described comprehensively, along with other ancient and modern tribes of the region, in a scholarly work containing a great amount of geographic material by Éric Boman: Antiquités de la Région Andine, 2 vols., Paris, 1908.]

Huergo, Eduardo. **Rectificación y canalización del Riachuelo.** *Bol. de Obras Públicas de la República Argentina,* Vol. 12, 1915, No. 4-6, pp. 172-177. Buenos Aires.

—— **Nitrate results in 1915.** *South American Journ.,* Vol. 81, 1916, No. 3, pp. 41-43.

Pedroso, Fernando de. **Informe sobre el estado de la exploración de los yacimientos petrolíferos del distrito minero de Comodoro Rivadavia.** 95 pp.; maps, diagrs., ills. *Dir. General de Minas, Geol. e Hidrol. Bol. No. 6, Ser. A.* Minist. de Agric., Buenos Aires, 1915.

Peña, N., M. Whittaker, C. Zúñiga, and E. Martínez. **Valors. horars. de los elementos meteorológ., temperat. del suelo y dispersión eléctr. en Santiago 1914.** 91 pp.; diagrs. *Inst. Central Meteorol. y Geofísico de Chile* [*Publ.*] *No. 17.* Santiago, Chile, 1915.

Whittaker P., Miguel. **Valores horar. de elementos meteorológicos en Los Andes 1911 y 1912.** 81 pp. *Inst. Central Meteorol. y Geofísico de Chile* [*Publ.*] *No. 16.* Santiago, Chile, 1915. [The publication *in extenso* of hourly observations was initiated by volumes giving values for Santiago (1911-13) and Punta Arenas (1911-12). The above volume pertains to Santa Rosa de los Andes, a particularly interesting station situated at the foot of the Aconcagua massif.]

Wiley, S. H. **Paraguay.** 8 pp. *Suppl. to Commerce Repts.,* Ann. Series, 1916, No. 45a. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

EUROPE

General

LYDE, L. W. **Some frontiers of to-morrow, an aspiration for Europe.** viii and 120 pp. A. & C. Black, Ltd., London, 1915. 2s/5d. 7½ x 5.

This title covers problems of very great range and complexity about which Professor Lyde has managed to crowd an amazing number of essential facts within the compass of a small book. By basing himself on a strictly scientific foundation he is able to present impartial discussions on the international frontiers which will probably undergo modification. His contention that frontiers must be natural, that is to say, that they must conform to geographical conditions, contains in itself the basis of abiding peace settlements.

But in spite of his stimulating remarks, the problems he brings to the reader's attention often involve in themselves such conflicts of interests that whatever solution may be suggested is bound to cause adverse criticism. How far popular aspirations, mitigated by principles of economic geography, will be recognized as practical and applicable is questionable. As an instance, the maintenance of the Croatian saddle with the Hungarian kingdom is economically desirable to Magyars but may not appeal to Croatians. In the case of Balkan nationalities especially, with the *odium theologicum* constantly at play, the task of carving up territory in independent blocks is aggravated.

A just tribute to the assimilating power of France is paid in the pages dealing with Alsace-Lorraine. The author appropriately might have called attention to the fact that, since Neolithic days, the civilization of Germanic peoples has mostly taken its source in the more advanced culture of their southwestern neighbors. And today the Alsatian, in spite of his German speech, is at heart more of a Frenchman than a German.

The erroneous use of the term "race" creeps in occasionally, as when mention of the Albanians is made. The old Thraco-Illyrian strain which is thought to appear in the tall and fair Shkypetar might more appropriately be called Nordic. The type is met with along ancient highways of migrations in Europe. In Albania Professor Lyde's Thraco-Illyrian is merely a blend of Nordic and Alpine type.

BEGUINOT, AUGUSTO. **I distretti floristici della regione littoranea dei territori circumadriatici.** Ills. *Riv. Geogr. Italiana,* Vol. 23, 1916, No. 2-3, pp. 65-90; No. 4-5, pp. 177-193.

CHITTENDEN, H. M. **Resources in men.** Diagr. *Scientific Monthly,* Vol. 3, 1916, No. 1, pp. 87-93. [Includes a table and a diagram showing the proportion of population between specified age limits in Britain, Germany, France, and the United States. Article as a whole deals with the present belligerents' resources in men.]

HANNAH, I. C. **Arms and the map: A study of nationalities and frontiers.** viii and 261 pp.; map, index. T. Fisher Unwin, Ltd., London, 1915. 3s/6d. 8 x 5. [A readable presentation of the problems of irredentist lands and peoples. The author has worked skilfully into his book knowledge of peculiarly timely interest without carrying his statements to undue length or depth. Much that is relevant to European and colonial politics of the past twenty years is summed up with a fine gift of exposition. Nevertheless, the work contains little that has not been discussed extensively in books and periodicals during the past two years.]

HOWE, F. C. **The struggle for the Mediterranean.** *Scribner's Mag.,* Vol. 59, 1916, No. 5, pp. 621-624.

—— **Jews, The, in the eastern war zone.** 120 pp. The American Jewish Committee, New York, 1916. 7½ x 5.

PHILLIPS, W. A. **Poland.** vi and 256 pp.; map, index, bibliogr. Henry Holt & Co., New York, [1916]. 50 cents. 7 x 5.

REINICKE, G. **Die Eisverhältnisse des Winters 1914-15 in ausserdeutschen europäischen Gewässern.** *Annal. der Hydrogr. und Marit. Meteorol.,* Vol. 44, 1916, No. 1, pp. 16-20.

REVELLI, PAOLO. **Una questione de geografia politica: L'Adriatico e il dominio del Mediterraneo orientale.** *Riv. Geogr. Italiana,* Vol. 23, 1916, No. 2-3, pp. 91-112.

SALOMON, L. **Étude des courants du Pas de Calais sur la ligne joignant Calais à Douvres.** *Annales Hydrogr.,* Ser. 2, Vol. 35, 1915, pp. 43-46. Service Hydrogr. de la Marine, Paris.

TUCKERMANN, WALTHER. **Die Sprach- und Kulturgrenzen in Rhein- und Maasland und in Belgien.** *Petermanns Mitt.,* Vol. 61, 1915, No. 12, pp. 462-464.

WARBURG, O. **Der kontinentale Wirtschaftsblock und die koloniale Landwirtschaft.** *Der Tropenpflanzer,* Vol. 19, 1916, No. 2, pp. 65-87.

Ward, R. DeC. **The weather factor in the great war: IV. October, 1915-February, 1916.** *Journ. of Geogr.,* Vol. 14, 1915-16, No. 10, pp. 373-384. [For previous instalments see the entry in the September *Review,* p. 237.]

France

Harlé, Edouard. **La fixation des dunes de Gascogne.** Maps, diagrs. *Bull. du Comité des Trav. Hist. et Sci.: Sect. de Géogr.,* Vol. 29, 1914, pp. 181-224. Minist. de l'Instr. Publ. et des Beaux-Arts, Paris.

The author of this exceedingly interesting paper, after describing the position of "the dunes which border the ocean on the coast of Gascony," gives an outline of the attempts to fix these shifting sands, efforts extending over a period from 1787 to 1864.

The work was begun by Brémontier, Ingenieur des Ponts et Chaussées, on the borders of the Basin of Arcachon, where he instituted the method of planting pines with common broom and covering the area sown with pine branches, care being taken to prevent their being blown away by pinning them to the ground. In about six weeks the broom seeds produced plants six inches high, which were two feet high by the end of the season. They afforded excellent shelter to the pine seedling, barely four inches high, and under their protection the young pines flourished until at length they crowded out—literally starved and suffocated—the protectors of their infancy, and rose high, "defiant of the raging sand-storms."

This work had the wise attention of Napoleon, who, in 1801, placed it in charge of a commission composed of the chief engineer of roads and bridges (Brémontier), the administrator of forests (Guyet-Laprade), and three members of the Société des Sciences, Belles-Lettres et Arts of Bordeaux. The work consisted first of the formation of a coast protective dune over which the sand rarely blew, and the cultivation of several kinds of grasses and even the maritime pine on this protective dune. This littoral dune was built up by the use of paling and wattle fences, and, when it had reached somewhat near to the desired height and shape, grasses, such as marram and lyme grass, which are able to grow upwards through a slowly rising sand surface, were planted with success. Marram grass was set out in tufts in winter, and between the plants seeds of the marram grass and of a great variety of sand-loving plants were sown.

So effective has been all Brémontier's process that today thousands of acres are covered with thriving and profitable pines and the inhabitants now gain a livelihood more profitable and less precarious than that obtained by fishing in the stormy waters of the Bay of Biscay. The Basin of Arcachon, now protected from blown sands, has its cultivated beds of oysters and other sea-foods. Agriculture and stock-raising have followed in the wake of silviculture.

M. Harlé, living in Bordeaux, has had access to the abundant literature of his subject in the archives of the Conservation des Forêts and has made excursions through a number of years to his interesting field of study. He has used well his opportunities.

Collier Cobb.

Bigourdan, —. **Distribution mensuelle de la nébulosité moyenne en France.** Maps, diagr. *La Nature,* No. 2232, 1916, July 8, pp. 27-29.

Blache, J. **Les vallées suspendues de la rive gauche du Grésivaudan.** *Bull. du Comité des Trav. Hist. et Sci.: Sect. de Géogr.,* Vol. 29, 1914, pp. 176-180. Minist. de l'Instr. Publ. et des Beaux-Arts, Paris.

Blin, Ernest. **Contribution à l'étude de la Seine et de ses affluents à travers les âges.** *Bull. du Comité des Trav. Hist. et Sci.: Sect. de Géogr.,* Vol. 29, 1914, pp. 155-167. Minist. de l'Instr. Publ. et des Beaux-Arts, Paris.

Coquidé, Eugène. **Quelques remarques sur le relief dans le nord de l'Île-de-France.** Ills. *Bull. du Comité des Trav. Hist. et Sci.: Sect. de Géogr.,* Vol. 29, 1914, pp. 259-262. Minist. de l'Instr. Publ. et des Beaux-Arts, Paris.

Cot, D. **Rapport sur la reconnaissance hydrographique partielle de l'embouchure de la Loire, exécutée en 1910.** Map, diagrs. *Recherches Hydrogr. sur le Régime des Côtes,* No. 993, Vol. 19, 1916, pp. 1-12. Service Hydrogr. de la Marine, Paris.

Cot, D. **Rapport sur la reconnaissance hydrographique de l'estuaire de la Seine, exécutée en 1913.** *Recherches Hydrogr. sur le Régime des Côtes,* No. 993, Vol. 19, 1916, pp. 83-98. Service Hydrogr. de la Marine, Paris.

Duhamel, H. **La première carte du Dauphiné par Jean de Beins.** Map. *La Géogr.,* Vol. 30, 1914-15, No. 6, pp. 437-442. [Date about 1617.]

Faucher, D. **La montagne de Crussol.** Diagrs., ills. *Bull. du Comité des Trav. Hist. et Sci.: Sect. de Géogr.,* Vol. 29, 1914, pp. 242-252. Minist. de l'Instr. Publ. et

des Beaux-Arts, Paris. [Physico-geographical study of an isolated mountain near Valence marking, as it were, the boundary between interior and Mediterranean influences in the Rhone valley.]

FICHOT, E. **Rapport sur la reconnaissance hydrographique de l'embouchure de la Gironde, exécutée en 1912.** Map. *Recherches Hydrogr. sur le Régime des Côtes,* No. 993, Vol. 19, 1916, pp. 12-82. Service Hydrogr. de la Marine, Paris.

GRIBAUDI, PIERO. **Il porto di Marsiglia e il canale Marsiglia-Rodano.** Maps. *Boll. della Reale Soc. Geogr. Italiana,* Vol. 5, 1916, No. 7, pp. 547-574. Rome.

JONES, J. E. **Lyon.** *Suppl. to Commerce Repts.,* Ann. Series, 1916, No. 5b, pp. 17-22. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

LA PORTE, F. **Contribution à l'étude des principales positions géographiques intéressant l'hydrographie française.** *Annales Hydrogr.,* Ser. 2, Vol. 35, 1915, pp. 1-41. Service Hydrogr. de la Marine, Paris.

LA PORTE, M. **Étude sur les plages de la côte sud de Bretagne, de Penmarch à la Loire.** Maps. *Recherches Hydrogr. sur le Régime des Côtes,* No. 993, Vol. 19, 1916, pp. 296-312. Service Hydrogr. de la Marine, Paris.

OSBORNE, J. B. **Havre.** *Suppl. to Commerce Repts.,* Ann. Series, 1916, No. 5b, pp. 1-17. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

PAWLOWSKI, AUGUSTE. **Le port du Havre et la crise des transports.** Diagrs. *La Nature,* No. 2230, 1916, June 24, pp. 411-416. [Illustrated by graphs and a plan of the port.]

PAWLOWSKI, AUGUSTE. **Les frets et la crise des transports maritimes.** Diagrs., ills. *La Nature,* No. 2223, 1916, May 6, pp. 289-293.

THACKARA, A. M. **France.** 15 pp. *Suppl. to Commerce Repts.,* Ann. Series, 1916, No. 5a. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

AFRICA

SUDAN AND UPPER GUINEA

B[ELTRAN Y] R[ÓZPIDE], R. **Las posesiones españolas del África occidental: Su situación política y económica en 1915.** *Rev. de Geogr. Colon. y Mercantil,* Vol. 13, 1916, No. 1-2, pp. 5-21. Real Soc. Geogr., Madrid. [The late internment of fugitive Germans from the Kamerun in the neutral territory of Muni has attracted attention to that little-known Spanish possession. Detailed information on the colony and on those of Fernando Pó and Rio de Oro may be found in a memorial recently issued by the Spanish government, of which the article listed above is an abstract.]

DJIAN, (G.). **Vers le Tchad.** Map. *Bull. Trimestriel de la Soc. de Géogr. et d'Archéologie d'Oran,* Vol. 38, 1915, No. 3-4, pp. 318-370.

—— **Gold Coast Colony, Trade of, in 1915.** *Board of Trade Journ.,* No. 1022, Vol. 93, 1916, June 29, pp. 89-92. ["From a report by the Comptroller of Customs at Accra, published in the Gold Coast *Government Gazette, Supplementary* (No. 1 of 1916)."]

HARDY, GEORGES. **Le bilan scientifique de l'Afrique Occidentale Française.** *L'Afrique Française,* Vol. 26, 1916, No. 1-2, pp. 3-26.

HOLLIS, A. C. **Sierra Leone: Report for 1915.** 33 pp. *Ann. Colonial Repts. No. 888.* London, 1916.

—— **Imperial industry, An.** *Journ. of the African Soc.,* No. 60, Vol. 15, 1916, pp. 320-334. ["Vegetable oils and oil-producing substances form the staple export of West Africa. The magnitude of this export may be gaged by the fact that in 1913 its value amounted to nearly ten millions sterling. Of that amount palm oil and palm kernels accounted for over eight millions." The industry has been the subject of a recent government investigation dealt with in the *Bull. of Imperial Inst.,* 1909, pp. 357-394, and in the "Report of Committee on Edible and Oil Producing Nuts and Seeds," June, 1916, *Cd. 8247,* of which the article is an abstract.]

LUGARD, F. D. **Nigeria: Report for 1914.** 52 pp.; map. *Ann. Colonial Repts. No. 878.* London, 1916. [Includes a report on the administrative and judicial changes resultant on the amalgamation on January 1, 1914, of Northern and Southern Nigeria into a single government.]

MÉZIÈRES, BONNEL DE. **Reconnaissance à Tendirma et dans la région de Fati.** Map. *Bull. du Comité des Trav. Hist. et Sci.: Sect. de Géogr.,* Vol. 29, 1914, pp. 128-

131. Minist. de l'Instr. Publ. et des Beaux-Arts, Paris. [Archeological reconnaissance in riverine lake region of the Niger above Timbuktu.]

UNWIN, A. H. **The forester's profession in Nigeria.** Ills. *United Empire,* Vol. 7 (New Series), 1916, No. 3, pp. 212-215.

CONGO BASIN AND LOWER GUINEA

—— **Angola, I commerci dell'.** *L'Africa Italiana,* Vol. 34, 1915, No. 11, pp. 297-302. Naples.

BADOLO, IGINIO. **Note sulle commerciale-economica del Distretto do Benguella.** 17 pp. *[Boll.] Direz. Gen. degli Affari Commerciali,* 1916, No. 2. Minist. degli Affari Esteri, Rome, 1916.

—— **Benguella Railway, The.** *United Empire,* Vol. 7, N. S., 1916, No. 2, p. 176. [When completed this railroad, whose main objective is the Katanga copper and tin belts, will provide the shortest route from Europe to Central Africa. Linked up with the Rhodesian and Congo systems and the German "Zentrallandbahn" it will provide additional transcontinental communication. About 400 miles of the line have been opened to traffic.]

—— **Congo, La neutralité du bassin conventionnel du.** Map. *Renseign. Colon. (Suppl. à l'Afrique Franç.),* 1916, No. 3, pp. 68-77.

GUILLEMAIN, KONSTANTIN. **Vegetationsformen in Katanga.** *Petermanns Mitt.,* Vol. 61, 1915, No. 12, pp. 474-475.

RENKIN, J. **L'avenir du Congo Belge.** *Renseign. Colon. (Suppl. à l'Afrique Franç.),* 1916, No. 3, pp. 61-68. [Translation of a lecture before the Royal Colonial Institute of London on Feb. 11, 1916.]

—— **Ventos, Gráficos da freqûência dos, no decénio de 1901 a 1910.** 12 pp.; diagrs. Apenso ão *Bol. Oficial da Província de Angola.* Dir. do Observatório Meteorol. e Magnético de Loanda. Loanda, 1915.

EAST AFRICA

DARLEY, HENRY. **Desiccation of East Africa.** *Journ. East Africa and Uganda Nat. Hist. Soc.,* Vol. 5, 1916, No. 10, pp. 99-102. [Remarks suggested by C. W. Hobley's paper on the "Alleged Desiccation of East Africa" (see review in the May *Review,* p. 394). The writer mentions phenomena that have come under his notice on the disappearance or diminution of water supplies both north and south of Abyssinia, which country he excludes from his observations. He says, for instance, "You can sit on the Marangule slopes and see almost to Abyssinia, a distance of fifteen to twenty days' march. This is absolutely waterless, with the exception of a few places in ancient *bondis,* where by digging you may obtain water. Within the last thirty years this was thickly inhabited. These inhabitants have now fled to the country sloping to the Nile where water is still obtainable."]

DEHÉRAIN, HENRI. **Addis-Ababa, résidence de l'empereur Ménélik, et son rôle dans l'exploration de l'Abyssinie.** *Bull. du Comité des Trav. Hist. et Sci.: Sect. de Géogr.,* Vol. 29, 1914, pp. 168-175. Minist. de l'Instr. Publ. et des Beaux-Arts, Paris.

DEHÉRAIN, HENRI. **Les Katamas dans les provinces méridionales de l'Abyssinie pendant le règne de l'empereur Ménélik.** *Bull. du Comité des Trav. Hist. et Sci.: Sect. de Géogr.,* Vol. 29, 1914, pp. 225-241. Minist. de l'Instr. Publ. et des Beaux-Arts, Paris. [The *katamas* are Abyssinian fortified posts in conquered or tributary territory.]

—— **East Africa Protectorate: Report for 1914-15.** 34 pp.; map. *Ann. Colonial Repts. No. 881.* London, 1916.

KEABLE, ROBERT. **A city of the dawn.** With an introduction by A. C. Benson. xv and 244 pp.; ills. Nisbet & Co., Ltd., London, 1915. 5s. 8 x 5½. [Vivid and sympathetic sketches of life at Mombasa.]

LAGANÀ, GINO. **Abissinia.** *L'Africa Italiana,* Vol. 34, 1915, No. 10, pp. 250-277. Naples.

LEGGETT, E. H. M. **The economic development of British East Africa and Uganda.** *Journ. Royal Soc. of Arts,* No. 3246, Vol. 63, 1915, Feb. 5, pp. 209-220. [Discussion, pp. 218-220.]

MERRIAM, C. H. **East Africa—game garden of the world: A review of Roosevelt and Heller's "Life Histories of African Game Animals."** Map, ills. *Amer. Museum Journ.,* Vol. 16, 1916, No. 3, pp. 145-153. [The book was reviewed in *Bull. Amer. Geogr. Soc.,* Vol. 47, 1915, pp. 190-192.]

Orde-Browne, G. St. J. **Mount Kenya and its people: Some notes on the Chuka tribe.** *Journ. of the African Soc.*, No. 59, Vol. 15, 1916, pp. 225-233. [Living on the wildest and most inaccessible slopes of Mount Kenya this minor tribe has until now retained many of its primitive characteristics.]

Ried, H. A. **Zur Anthropologie des abflusslosen Rumpfschollenlandes im nordöstlichen Deutsch-Ostafrika.** 295 pp.; diagrs., ills., bibliogr. *Abhandl. des Hamburgischen Kolonialinstituts,* Vol. 31, 1915. Hamburg. [Consists exclusively of discussion of crania and long bones.]

—— **Usambara described.** *Times Weekly Edition,* No. 2,060, Vol. 40, 1916, June 23, p. 486. [Coastal regions bordering British East Africa.]

ASIA

Russian Central Asia

Busse, Walter. **Bewässerungswirtschaft in Turan und ihre Anwendung in der Landeskultur.** 326 pp.; maps, diagrs., ills. *Veröffentlichungen des Reichs-Kolonialamts Nr. 8.* Gustav Fischer, Jena, 1915.

That the German Colonial Office in the midst of the great war should publish a book on irrigation in Russian Turkestan offers a striking example both of German energy and foresight, and of the compelling force of geographical environment. Germany wants her own supply of cotton. Among her erstwhile colonies German Southwest Africa is the only one that offers much prospect of producing that useful fiber. But Southwest Africa is very dry, and no cotton can be raised without irrigation. Russian Turkestan is the only part of the world which has a climate at all similar to that of the former German colony, and which at the same time has done anything important in the way of cotton culture. Hence what is more natural than a book on irrigation in Turan?

The book is admirably written. The first section deals with the dry climate, whose long, hot, rainless summers have a mean temperature above 70° from May to September, with extreme maxima as high as 114°F. The second emphasizes the wonderful fertility and easy cultivation of the fine-grained yellow loess soil, which, however, is frequently injured by the accumulation of salt. Next come brief sections on the people and their methods of agriculture. The following chapter on irrigation contains many interesting details as to the technique of irrigation, the laws as to water rights, land tenure, and the like. Then comes the heart of the book, pp. 70-101, on "Cotton Culture and Colonization Policy," while the remaining 211 pages are devoted to a minute description of agriculture and irrigation in the various provinces.

The argument of the main section runs as follows: About 1880 Russia began to think seriously of manufactures and hence of cotton culture. That turned her eyes to the deserts and great rivers of Turkestan on the one hand and to America on the other. American upland cotton was successfully introduced into Turkestan, although the quality is not quite up to the American standard. Today half Russia's supply comes from her own desert oases, but half is not enough. Since Turkestan has millions of acres of wonderful soil, since four-fifths of the water of the great Amu and Syr Rivers is wasted, and since Russia has millions of peasants who want to migrate, why not bring water and peasants to the land and let them produce cotton for Russia's growing textile mills? Why not go farther? In Ferghana at the base of the Alai Mountains over 30 per cent of the cultivated land is devoted to cotton, while farther north in the province of Semiryechensk cotton will not grow, but grain and cattle thrive. Why not have such transportation facilities that Ferghana can devote 80 or 90 per cent of its cultivable area to cotton and can be fed by Semiryechensk?

Busse criticizes this official program. In the first place, Russia moves in a vicious circle, for, although she is poor in capital, she will not let foreign capital do the work. Secondly, the official program does not make due allowance for the deterioration of the soil and is likely to lead to grave economic disasters worse than those which our own South has experienced because of its reliance on a single crop. Thirdly, the Russian peasant does not understand irrigation and intensive agriculture, he does not like them, and he looks down on the native "Sarts" from whom he ought to learn their value. Moreover, he cannot stand the long, hot summer, which weakens him so much that he becomes lazy and cannot compete with natives. Therefore he had rather move up into the mountains or to Siberia than stay in the lowlands of Turkestan, and there is not much hope of his converting Turkestan into a genuine part of Russia. The hope of Turkestan, so Busse seems to think, is in increasing the irrigated areas by means of foreign capital and training the natives to cultivate cotton as an essential part of a rational rotation of crops.

Ellsworth Huntington.

KRIŠTOFOVIČ, A. **Les vestiges de l'existence du chêne dans la steppe Kirghize de Turgaj.** *Bull. de l'Acad. Impér. des Sci.* [*de Pétrograd*], Ser. 6, 1915, No. 10, pp. 987-989. [In Russian.]

PRIGOROVSKIJ, M. **Quelques faits nouveaux sur les dépôts terrestres tertiaires de Turgaj .** *Bull. de l'Acad. Imp. des Sci.* [*de Pétrograd*], Ser. 6, 1915, No. 10, pp. 12, pp. 1265-1280. [In Russian.]

TAGANCEV, V. N., AND V. A. SILBERMÜNZ. **Sur la désagrégation désertique dans les glaciers des montagnes de Turkestan.** Map. *Bull. de l'Acad. Imp. des Sci.* [*de Pétrograd*], Ser. 6, 1914, No. 14, pp. 1041-1052. [In Russian.]

SIBERIA

DIGBY, BASSETT. **Along a great Siberian river.** Ills. *Travel,* Vol. 27, 1916, No. 2, pp. 18-21 and 46-48. [Good general account of life in the small villages along the Lena River. The valley is a deep and narrow trench cut below the level of a vast trackless, forest-covered plateau, part of the *taiga* (see article by E. K. Reynolds in April number of *Review,* p. 256). Especially interesting is Vitimsk, a ''dead'' village opposite the inflow of the Vitim. It is almost without residents until late September, ''when it is invaded by 10,000 thirsty miners from the Bodaibo gold workings, weighed down with a summer's deferred pay.'']

DOROGOSTAJSKIJ, V. C. **Rapport préliminaire sur une excursion dans les monts de Iablonoï executée en 1914.** *Bull. de l'Acad. Imp. des Sci.* [*de Pétrograd*], Ser. 6, 1915, No. 5, pp. 401-420. [In Russian.]

HALL, H. U. **The Siberian expedition.** Ills. *Univ. of Pennsylvania Museum Journ.,* Vol. 7, 1916, No. 1, pp. 27-45. [Abstracted in the September *Review,* pp. 229-230.]

JOCHELSON, V. I. **Note sur la publication de ses travaux linguistiques, folkloristes et ethnographiques concernant les peuples du nord-est extrême de la Sibérie.** *Bull. de l'Acad. Imp. des Sci.* [*de Pétrograd*], Ser. 6, 1915, No. 16, pp. 1697-1710. [In Russian.]

NANSEN, FRIDTJOF. **Sibirien, ein Zukunsftsland.** x and 383 pp.; maps, diagrs., ills., index. F. A. Brockhaus, Leipzig, 1914. Mk. 10. 9½ x 6. [The English version was reviewed in *Bull. Amer. Geogr. Soc.,* Sept., 1915, p. 707.]

POPLAWSKA, H. **Aux limites du nord-ouest des steppes transbaïkaliennes (Esquisse phyto-géographique).** *Bull. de l'Acad. Imp. des Sci.* [*de Pétrograd*], Ser. 6, 1915, No. 7, p. 587. [Brief note in Russian.]

SCHÖNEBECK, ALFRED. **Samfundsliv i Sibirien.** Ills. *Geografisk Tidskrift,* Vol. 23, 1915-16, No. 5, pp. 163-178. Copenhagen. [Life in Siberia.]

SUKAČEV, V., AND H. POPLAVSKAJA. **Recherches botaniques dans la zone litorale du lac Baical pendant l'été 1914.** Ills. *Bull. de l'Acad. Imp. des Sci.* [*de Pétrograd*], Ser. 6, 1914, No. 17, pp. 1309-1328. [In Russian.]

CHINA

HSU, MONGTON CHIH. **Railway problems in China.** 184 pp.; map, bibliogr. *Columbia Univ. Studies in Hist., Econ. and Public Law,* Vol. 66, No. 2. Longmans, Green and Co., New York, 1915. $1.50.

The railway in China has long been an instrument for political aggression on the part of foreigners. No nation in the world has been so harried in its economic growth by foreign powers as China; no account of the subject, therefore, can fail to take into consideration the politics involved in arranging a transportation system which is destined to alter the strategic as well as the industrial situation of the country.

The opposition of the Chinese to the introduction of railways melted away in 1895 at the close of the war with Japan, when officials and people were promptly convinced of the impossibility of defending the empire from attack without greater facilities for transporting troops. The conversion of the court to this new attitude brought upon China a host of proposals from Western nations to secure concessions for constructing its railways. In less than four years nineteen roads, involving a total length of more than 6,000 miles, had been granted to the agents of five nations. Happily for China most of these were paper schemes that never matured, as the powers concerned came into collision with each other over their respective spheres of interest in constructing the lines and exploiting the territory covered, but China itself remained helpless amid their controversies and did not escape from unfair contracts without heavy payments. The decade following the disastrous war with Japan involved the empire in so many loan agreements

with foreign capitalists as to be called the period of the "battle for concessions," when the financial profits accruing from the game of grab tempted many concerns to excesses that filled the Chinese with apprehension and helped to bring about the Boxer revolt.

During the decade which followed the Russo-Japanese war China slowly emerged from its former position of mechanical impotence and trained a small group of engineers who have proved themselves capable of constructing lines and producing the necessary equipment for running serviceable railways. The government has also become aware of the risk of national bankruptcy attending indiscriminate loans extorted and controlled by foreign syndicates, and has adopted, so far as possible, a policy of railroad nationalization. So profoundly is the life of China affected by this modern instrument of economic development that its attempt to wrest the regulation of the railways from the provinces served to precipitate the rebellion of 1911, as the struggle for concessions had brought on that of the fanatical Boxers.

It would be hard, perhaps, to find a more convincing illustration of the intimate relation between social and material progress and political geography than in the forty years of railroad history in China. No country in modern times has been so obviously the victim of its own ignorance and obduracy in resisting the necessary means of defending its own territory and promoting its commercial welfare by developing an adequate system of communications. Largely because of its lack of railways China has already lost its outlying frontiers and been reduced to financial servitude, which will at best long hamper its proper reorganization and may subject the country to direct control by foreigners.

Doctor Hsu's volume is admirably arranged and clearly expressed; however, in proportion to the facts there is too little discussion of the problems presented. The volume is also unfortunately marred by a cheap and inadequate sketch-map which is no credit to the publishers. F. W. Williams.

Anderson, G. E. **Hongkong.** 7 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 52b. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

Brockway, Alice P. **A trip to the Orient.** 83 pp.; ills. The Griffith & Rowland Press, Philadelphia [1916]. 8 x 5½. [Leaves from a missionary's note book. The trip—Oct., 1914-May, 1915—is described from San Francisco via Yokohama and Nagasaki to Shanghai, thence via Hangchow up the Tsien-tang River to Kinwha, the author's destination, in the center of Che-kiang Province, where two months were spent. China was left by way of Shanghai, Canton, and Hongkong.]

Hanson, G. C. **China: Swatow.** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 52a, pp. 1-12. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C. ["The prosperity of Swatow and its vicinity depends upon the sale of products of local origin among emigrants from this district who are working in places in the South Seas, such as the Straits Settlements, the Dutch East Indies, and the Federated Malay States, and upon the remittances these emigrants send to Swatow."]

King, L. M. **Report for the year 1913 on the trade of Tachienlu.** 9 pp. *Diplomatic and Consular Repts.*, Ann. Series, No. 5561. London, 1916. [Abstracted in the September number, p. 230, under the title "Tachienlu, the Chinese Gateway to Tibet."]

Pontius, A. W. **China: Foochow.** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 52a, pp. 12-22. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

Reed, A. C. **Changsha and the Chinese.** Ills. *The Scientific Monthly*, Vol. 2, 1916, No. 3, pp. 239-259. [Changsha, which lies at the head of navigation on the Liang River, the right tributary of the Yan-tze-Kiang which it reaches through the large Tung Ting Lake, is the metropolis of Hunan, a mining and agricultural province.]

PHYSICAL GEOGRAPHY

Meteorology and Climatology

Humphreys, W. J. **Wind velocity and elevation.** Diagrs. *Monthly Weather Rev.*, Vol. 44, 1916, No. 1, pp. 14-17.

Kimball, H. H. **Duration of twilight.** *Monthly Weather Rev.*, Vol. 44, 1916, No. 1, pp. 12-13. [Reprinted from the paper "Daylight Illumination and the Intensity and Duration of Twilight" published in *Trans. Illuminating Engineering Soc.*, Cleveland, Ohio, some time in 1916.]

Rolf, B. **Condensation upon and evaporation from a snow surface.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 9, p. 466.

SIMPSON, G. C. **Electricity of atmospheric precipitation.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 9, p. 445.

TALMAN, C. F. **Brief list of meteorological textbooks and reference books: A selection of works suitable for general, scientific, and university libraries in the United States.** 17 pp.; index. *U. S. Weather Bur.* [*Publ.*] *No. 512.* Washington, 1913.

HUMAN GEOGRAPHY

ECONOMIC GEOGRAPHY

Production

MOON, F. F., AND N. C. BROWN. **Elements of forestry.** xvii and 392 pp.; map, ills., index. J. Wiley & Sons, New York, 1914. $2. 8½ x 5½.

The need of a concisely written book on the principles of forestry has been felt by those who are interested in presenting the subject of trees and forestry to college students and to the public at large. The present book seems to fill this want. It is well arranged, and the illustrations are good. The subject matter is arranged so as to define forestry, the need of forests at home and abroad. The tree is considered botanically from the viewpoints of parts and functions, characteristics, soil and moisture requirements, growth, light tolerance, and life. Silvics is concerned, as a topic, with the forest as a community and with the life history of the forest, while silviculture is concerned with the systems of reproduction and forest maintenance by cuttings, artificial and natural regeneration. The authors describe forest protection, give the essentials of forest mensuration, lumbering, wood utilization, wood technology, and wood preservation, and treat, in a concise way, forest economics and finance.

Of especial interest to geographers are the remaining pages on the forest regions of North America, illustrated by a map. The northern, southern, Rocky Mountain, and Pacific coast forests are considered in the remaining descriptive pages, while useful appendices and a glossary complete the book. JOHN W. HARSHBERGER.

NEWBIGIN, M. I. **Tillers of the ground.** viii and 224 pp.; ills. Macmillan & Co., Ltd., London, 1910. 50 cents. 7 x 5.

Miss Newbigin's book is an attractive, readable little volume devoted to an exposition of the principles underlying agriculture and to the history of agricultural development. Though primarily written for the people of Great Britain, it is in good part a story of certain phases of agricultural development in America, especially in reference to the introduction of dates, figs, and alfalfa.

The work of the Chinese and Japanese two hundred years before Christ, the contributions of Herodotus and Pliny, of the U. S. Reclamation Service and Bureau of Plant Industry are all touched upon in passing, and the United States government bureaus are given special consideration and commendation. Sometimes the author seems carried away a bit by her enthusiasm and appears to stretch a point beyond the bounds of accuracy. For instance, it is a little extravagant to say that, under the touch of the Reclamation Service, "the whole desert blossoms like the rose, bursts forth into fruit and flowers, produces the wine which makes glad the heart of man, and the oil which causes his face to shine."

Yet the book contains much accurate, carefully selected material, put together in a telling and mind-opening way. It is a book that is worth while for any one interested in agriculture and the geography of modern agricultural development.

RICHARD ELWOOD DODGE.

ALBES, EDWARD. **Maize—the greatest of American food products.** Ills. *Bull. Pan American Union,* Vol. 43, 1916, No. 1, pp. 33-54.

BRETON, A. **Les engrais et la guerre.** Diagrs., ills. *La Nature,* No. 2230, 1916, June 24, pp. 406-411.

DORRANCE, J. G. **Wood waste—I: The woods, the mill, and the factory.** Diagrs., ills. *Scientific American,* Vol. 114, 1916, Apr. 8, pp. 382-383 and 390.

—— **International Institute of Agriculture, The: Its organization, its work, its results.** 45 pp.; map. International Inst. of Agric., Rome, 1915.

MARSHALL, F. R., AND L. L. HELLER. **The woolgrower and the wool trade.** 32 pp.; diagr., ills. *U. S. Dept. of Agric. Bull No. 206.* Washington, D. C., 1915.

PAYEN, ÉDOUARD. **La soie: Sa production, sa consommation.** *L'Économiste,* No. 39, Vol. 2, 1915, pp. 396-398. Paris.

SALLIOR, P. **Le caoutchouc et la guerre.** Ills. *La Nature,* No. 2233, 1916, July 15, pp. 33-37.

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THE MUSEUM OF THE AMERICAN INDIAN, HEYE FOUNDATION

By GEORGE H. PEPPER

How old is the American Indian? Whence came he and when? Is he an immigrant whose ancestors first saw the light of day in some far-distant land or is he indigenous to the western hemisphere? These oft-repeated questions have been puzzling geographers and anthropologists since first Columbus set foot upon the new land that was destined to present so many problems for the savants of the eastern world. Years of research and the expenditure of untold thousands have brought us to the realization that the origin of the American Indian is still as great a problem as it ever was and will no doubt claim the attention of scientific investigators for many years to come.

That the history of our primitive races may receive the attention that it deserves and that the proper facilities for the study of American anthropology may be presented to the scientist and general student in the proper way, a new institution has been founded, unique in the annals of anthropological work in this country, whose object will be the preservation of everything pertaining to our American tribes. It will be American preeminently, excluding everything that pertains to foreign peoples and claiming as its own naught but the productions of primitive man in the two Americas. This new stimulus to American anthropological studies is the Museum of the American Indian, Heye Foundation. The institution, fathered by George G. Heye of New York City, embodies the hopes and plans of years of active work and will contain not merely collections of primitive art and utilitarian productions but everything that will be of value to the student who is endeavoring to add something to the general knowledge of the American Indian.

The corner-stone of the new museum was laid on Wednesday, November 8th, at Broadway and 155th Street, in the square now partly occupied by the Hispanic Society of America, the American Geographical Society, and the American Numismatic Society. It will be remembered that in this

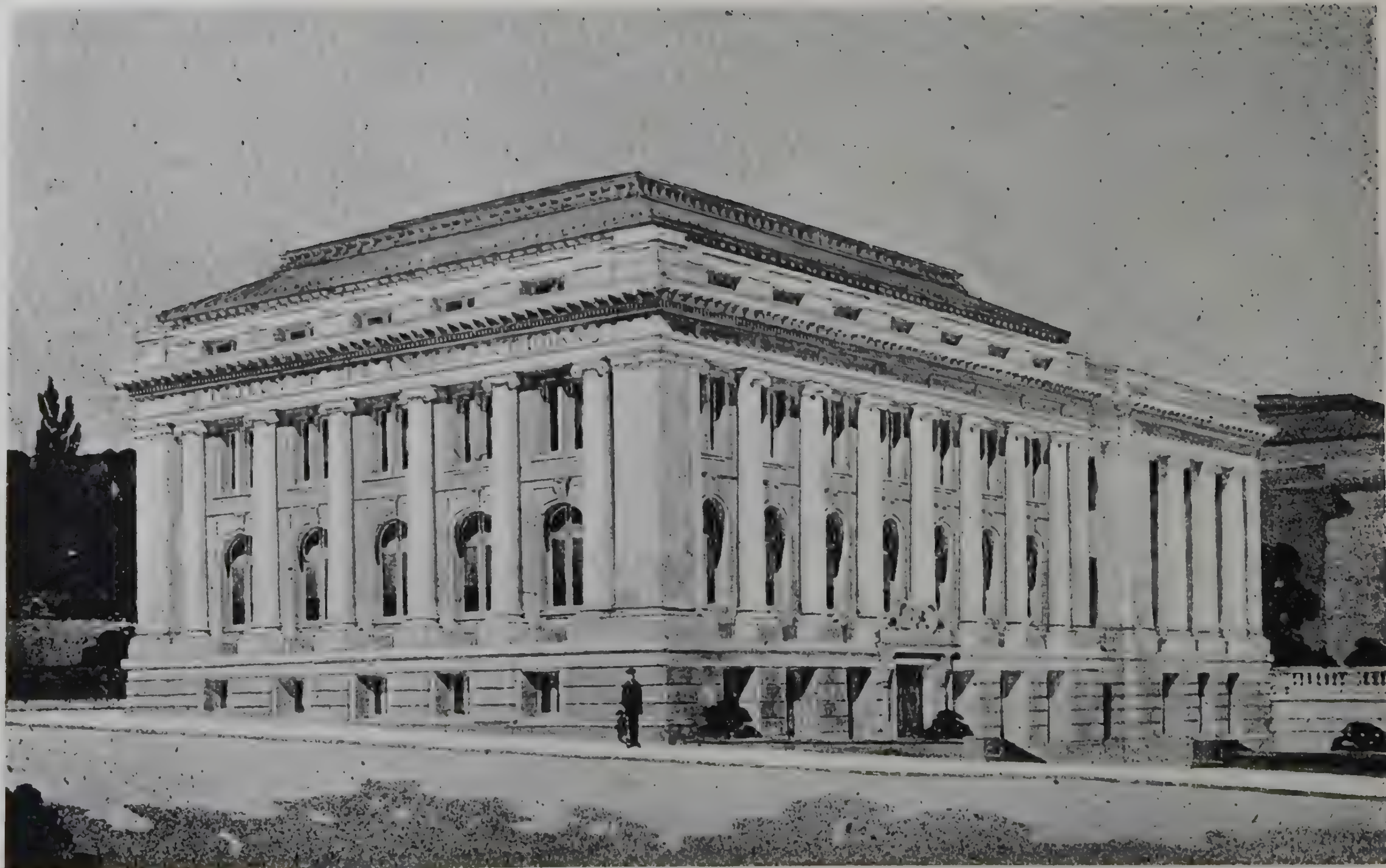

FIG. 1—New building of the Museum of the American Indian, Heye Foundation, now in course of construction at Broadway and 155th Street, New York City.

square will be located the future home of the American Academy of Arts and Letters and the American Institute of Arts and Letters. The Museum of the American Indian will be especially interesting to the Fellows of the American Geographical Society because of the close relations between geographic environment and the culture and distribution of primitive man. The two institutions will work in a spirit of hearty co-operation, and their exhibition halls, practically adjacent, will be visited by thousands from every part of the country.

As perspective is required to present the history of this great undertaking in its proper light we must go back to the time, a decade and a half ago, when Mr. Heye became interested in the problem of the American Indian. His novitiate was of short duration, for it soon became apparent

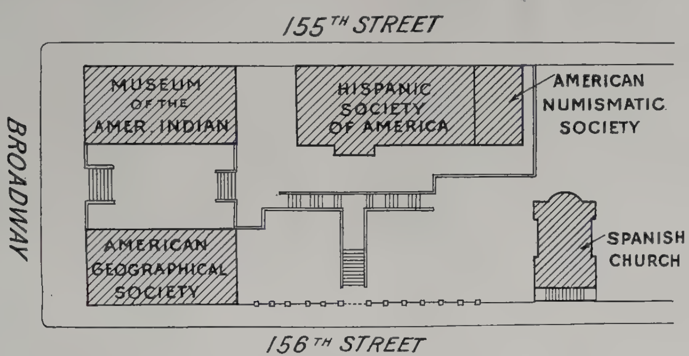

FIG. 2—Plan showing the location of the Museum of the American Indian, Heye Foundation, now under construction, with reference to the American Geographical Society and the other institutions at Broadway between 155th and 156th Streets, New York City.

that systematic collecting, scientific recording, and untiring efforts in preservation of specimens were the three prerequisites of success. Numerous museums were visited and methods of preparation of specimens and catalogs were studied. In 1903 the first large collection was purchased. This was the Henry E. Hales collection of prehistoric Pueblo pottery and other material from the ruins in Socorro County, New Mexico. It was shortly after the purchase of this collection that the writer became associated with Mr. Heye and during the summer of 1904 obtained for him his second large addition, a collection of pottery vessels from the St. Johns region of Arizona. These two accumulations of Pueblo material form the real nucleus of the Heye collection. From the first, catalog entries were made on two sets of cards, the individual sets being kept in different buildings, thereby insuring the data against loss by fire. Throughout the development of the project of making a collection along the most approved scientific lines, one idea was dominant—the bringing together of material, not for personal gain or the mere gratification of a personal hobby but for the use of students in their studies of the artifacts of our primitive peoples.

FIG. 3.

FIG. 4.

FIG. 3—Panoramic view of Cerro de Hojas, Manabi, Ecuador. These Andean foothills were terraced by the aborigines, and on these terraces their houses were built.

The work of the new museum will not be confined to the exhibition of material. One of the main features will be the study collection, consisting of large series of specimens so arranged that they can be utilized to advantage. This has long been the dream of museum curators, and many students and collectors have felt the need of collections so arranged that they could obtain the needed information through personal study of the objects. Thus science and education will go hand in hand, and it will be the aim of those interested in the museum work to instil in the popular mind the necessity of preserving all objects of Indian origin, especially those of a perishable nature.

The story of the American Indian north of Mexico in the early days before the advent of the alien was, until comparatively recent times, shrouded in mystery. Having no written language, he left no records that can be woven into a consecutive story. Pictographs there are in abundance, but most of them are similar to the crude attempts of children in the delineation of some personal adventure. The years that have passed since the time of the Conquest have witnessed the natural decay and disintegration of the perishable objects that were then in use. In many cases, especially in the central part of the United States and in Canada, the Indians placed their dead in the open, and, though their prized possessions were deposited with them, the passing years have left but few vestiges of costumes, objects of wood, or other artifacts that would tell so much of the habits, ceremonies, and home life of those who used them. Furthermore, in certain parts of America cremation not only of the bodies but of vast masses of objects was practiced. For the last hundred years the rapid colonization and development of great sections of the New World have resulted in the destruction of cemeteries, mounds, and other aboriginal burial-places.

In a few instances nature has exhibited a kindlier mood, and in the fastnesses of caves has preserved rare woven fabrics and other materials of an esthetic and utilitarian nature. The atmospheric conditions prevailing in some of the caves in Utah, Colorado, New Mexico, Arizona, and northern Mexico have caused the desiccation of practically all of the organic matter therein contained. Human tissues have undergone a natural drying process which has mummified the bodies, in a natural way, as perfectly as did the elaborate mummifying processes of the ancient Egyptians. From these caves and from certain others in Kentucky and Oklahoma much material of a highly enlightening nature has been obtained, but nothing to show that their inhabitants had reached that cultural horizon that marks the beginning of written records. The dry and arid soil and the general conditions prevailing along the Peruvian coast have preserved, in the *huacas*, practically everything that would exhibit native utilitarian and artistic products. Here, however, the very wealth of material has attracted the ruthless search of the treasure seeker, resulting in the practical destruction of much that the student needs for reconstructing the life history of the

ancient people. One other region is to be found in America where nature has assisted in the preservation of the remains. This is in the great northwestern section of Argentina. Outside of these localities, owing to the disintegration of perishable artifacts, the story of archeology must remain decidedly incomplete. In Mexico the Spaniards found a culture that was more highly developed than the cultures that existed north of the Rio Grande. Painted records had been used perhaps for centuries before the landing of the old conquistadors. Ideographic records of conquests, astronomical and astrological observations, and of general events in the lives of the people were depicted on deerskin or maguey fiber. These "codices," some of which retain the annotations made by the early padres, with the elaborately carved records on stelae and other stone monuments, have proved to be of wonderful value in the study of Mexican archeology, but consecutive records, histories, poems, rituals, such as are recorded on the cylinders of Babylon or on the papyri of the Egyptians, do not exist in the New World, and, having no such heritage, the student must evolve the story of the various prehistoric tribes from what they have left behind them. Hence the need of continued scientific study of the glyphs and codices of Mexico and Central America and the investigation of the mounds, the caves, the middens, and other places wherein may be found objects that may add to our knowledge. The interrelation of objects may prove of prime importance in the determination of the use to which they were put by the particular people of the region, and it is this gathering and correlation of facts that will enable our investigators, through analogy, to arrive at definite conclusions and thus prepare for the historian the skeletal frame upon which the life history of our aborigines may be built.

Field Expeditions

The first actual field collecting was begun in 1904, when Mr. Frank D. Utley visited Porto Rico in the interest of Mr. Heye. He succeeded in obtaining a wooden *duho,* or seat, several stone collars, a number of petaloid celts, and other stone implements. During the same year the writer carried on exploration work in the *yacatas,* or mounds, of the *tierra caliente* of Michoacan, Mexico, where many pottery vessels and other objects were found associated with the burials. In 1905, Mr. Utley collected in Panama and Costa Rica, but the first comprehensive plans for extended exploration work were not formulated until 1906. At that time Prof. Marshall H. Saville of Columbia University planned and commenced this work. It had for its object an exhaustive survey of a certain portion of the Andean and coast regions of the northwestern portion of South America, beginning with the southernmost limits of Ecuador and extending northward to the Isthmus of Panama. A continuation of the work was planned to include the northern and northeastern parts of South America and the islands of the West Indies.

Fig. 5.

Fig. 6.

Fig. 5—Modern native bamboo house on Cerro Jaboncillo, province of Manabi, Ecuador. Judging from the prehistoric house enclosures, it would seem that in ancient times this was the prevailing type of house.

Fig. 6—Prehistoric stone seat found on a house site on Cerro Jaboncillo near the town of Monte Cristi, province of Manabi, Ecuador.

In 1906 Professor Saville, accompanied by Mr. Foster H. Saville, carried on investigations in Ecuador in the province of Manabi and in the interior valleys of the Andes near Riobamba. Owing to the unexpected richness of the Ecuadorian field the first plan, namely, the making of a reconnaissance of Ecuador and Colombia, was abandoned, and Mr. Heye decided to devote funds for a more thorough survey of the field.

In 1907 the second expedition, consisting of two parties, was sent to Ecuador. The first party, consisting of Foster H. Saville and Lewis W. Niendorff, was sent out in February in order to complete the collecting work begun the year before. Later they went to the vicinity of Ambato, where large and representative collections were obtained. In May the second party, consisting of Professor Saville and the writer, went to Manabi. At this time Mr. Niendorff was sent to the Island of Puna, while the other three members of the expedition carried on the work of exploration in Manabi. In August Professor Saville and Mr. Niendorff went to the province of Esmeraldas, where investigations were carried on; thirty-five locations were visited and large collections were obtained, excavations being carried on in several places.

In 1908 the third expedition visited the coast of Ecuador. Professor Saville was assisted by the American Consular Agent at Esmeraldas, Mr. George D. Hedian. During this season general work was carried on in the province of Manabi in the vicinity of the equator.

In 1910 the fourth Ecuadorian expedition carried on explorations in the interior, especially in the provinces of Bolivar, Léon, Pichincha, Imbabura, and Carchi, the work of the expedition ending at the Colombian frontier. On this trip Professor Saville had four assistants, among whom was Señor Manuel Gamio, the present Inspector of Ancient Monuments in Mexico. Since that time Professor Saville has made another trip to Esmeraldas, and in 1914, accompanied by Foster H. Saville and Randolph M. Saville as assistants, spent a season in exploring mounds and village sites in the municipality of Tumaco, Colombia, along the southern section of the Colombian coast. In 1916 the work of completing this survey of the coast of Colombia along the Ecuadorian frontier was accomplished. So far as Ecuador is concerned there remain to be investigated but the southern provinces that adjoin the frontier of Peru.

All of these researches were purely archeological. In the coast region of northern Ecuador is the only tribe of pure-blood Indians at present living on the coast. They inhabit the region near the Rio Santiago and form part of a former numerous people known for many years as the Yumbos. These are true Cayapa Indians, and a study of this tribe was deemed an essential part of this investigation in order to ascertain if any traditions remained which might throw light on the antiquities of the coast. Dr. S. A. Barrett was sent to the field in 1908 and 1909 to investigate the habits, customs, and language of the Cayapa, and his report is now ready for the press.

In 1915 Professor Saville and Randolph M. Saville made a reconnaissance in the Department of Cortez, Honduras. An examination was made of the archeological conditions along the Ulua River, and an important collection of antiquities was brought together illustrating the complex features of this section of Central America, objects of several well-known and far-distant cultures being found in the restricted area of the broad valley in which flow both the Ulua and Chamelecon Rivers.

As a result of this continued and consistent work the Museum possesses the only comprehensive collection from Ecuador that has ever been brought together. The interior has furnished large series of pottery vessels, including a wonderful lot of mortuary jars that were found in the *huacas* of Angel in the province of Carchi. These *huacas,* or well-like tombs, were discovered by the natives, who in some way ascertained that gold had been buried by the older peoples with the bodies. The entire town moved to the ridges that contained these *huacas,* and systematic grave robbery was carried on. They found many gold ornaments, which were melted as soon as taken out, also the symmetrical jars before mentioned. Many of these vessels were preserved and may now be seen in the temporary home of the Museum at 10 East 33rd Street, New York City. Stone, bone, and metal objects and ornaments were found in abundance in many parts of the regions visited by the expedition.

During the second season, 1907, the writer was in charge of the excavation work near Manta in the province of Manabi. The Andean foothills near this town were dotted with house sites which contained numerous stone carvings, the most noteworthy being the stone seats, most of which are supported on the backs of human or animal figures. Of the sixty-five seats that were found a few are quite small, but many are very heavy: one specimen weighs over 300 pounds. Two large burial mounds were explored, one of which, according to a local tradition, had on its summit a large stone table encircled by a ring of these seats. Fragments of seats were found at the base of one of the mounds, but none was encountered beneath the surface, and there were no evidences of the presence of the stone table, the greater part of the objects found with the burials being pottery vessels.

On the coast of the province of Esmeraldas many pottery vessels and gold and platinum ornaments have been found. The gold is of particular interest, as the individual pieces are in the form of filigree or other forms of delicate techniques. Included in the gold material from Ecuador is a large crown that was found in a tomb in Sigsig, province of Azuay; some of the objects found with it, including a throwing stick incrusted with gold, were destroyed by the natives who found them, but many of the accompanying objects were rescued.

Near the coast town of Atacames, province of Esmeraldas, burials of a peculiar nature were found by Professor Saville; they were in large cylindrical pottery tubes which had been superimposed to form a *huaca.* These

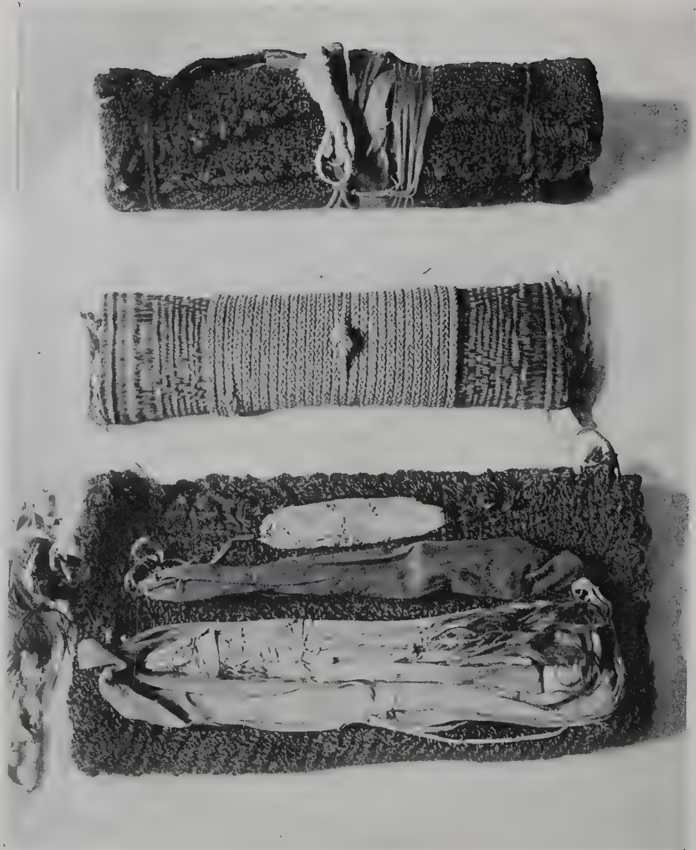

FIG. 7.

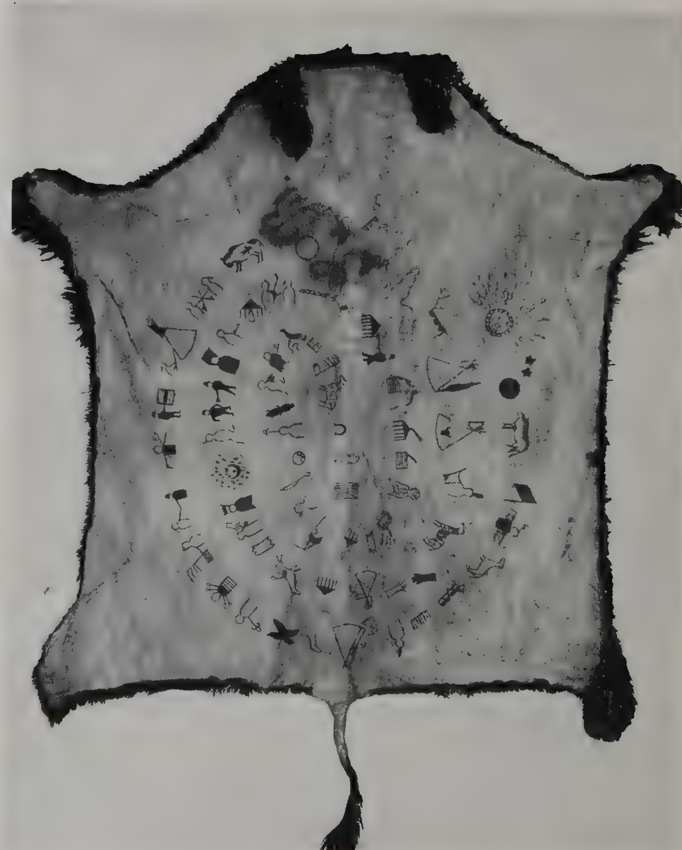

FIG. 8.

FIG. 7—Osage scalp bundles. The upper one is complete. The other has been opened and shows the rush bag wrapped with braided buckskin, also the contents of the bundle, including the "scalp bird."

FIG. 8—Painted buffalo robe of the Sioux Indians. This particular record is known as "Lone Dog's winter count" and is a record of events typifying years from 1800-01 to 1870-71. It starts with the middle figure, which means thirty Sioux were killed by the Crow Indians; the last year, shown in the upper right hand corner, records the death of fourteen Sioux in battle with the Crows. Thus the principal event of each year stands for the year itself.

prehistoric people had no doubt migrated from the interior, where they had been accustomed to carve their *huacas* in the solid rock; finding conditions unsuited to such work they produced a substitute by lining a hole with the tubes. In one of these was found a skull containing teeth that had been inlaid with bands of gold and in another a jaw having circular gold inlays in the teeth. This ornamentation was done for purely ceremonial purposes or for adornment and is a wonderful example of pre-Columbian dentistry. These specimens are now in the Museum collection.

Two large volumes and several monographs concerning the work in this region have been published,[1] and others are in press.

In 1907 a general archeological survey of the West Indies was begun. The Rev. Thomas Huckerby of the island of St. Vincent was entrusted with the work of collecting the scattered material that is found in such abundance on this island. Since then he has extended his field of operations to Tobago, Trinidad, Grenada, Carriacou, Cannouan, and many of the other islands of the Lesser Antilles and of the Windward Islands. He is still engaged in this most important work, and through his efforts the Museum now has an archeological collection from these islands that is second to none. The wide range of axe and celt forms from St. Vincent and Grenada, especially the ceremonial types of the former class of implements, presents an exhaustive series for the study of the evolution of animal and other forms. Of still greater interest to the student is a series of both well-known and fantastic objects made from a metamorphosed volcanic scoria. There are several hundred specimens, all of which were found in a restricted area near Fancy at the base of the volcano of La Soufrière. Nothing like them has been found in the adjacent islands, and it is quite probable that they were made and deposited at this place as votive offerings in way of propitiation to the god of the volcano.

Mr. Theodoor de Booy of the Museum staff started his West Indian investigations in the islands of the Bahamas, especially those included in the Caicos group. Among the few prehistoric implements from these parts is a monolithic axe, and in one of the caves a perfectly preserved Lucayan paddle was found. It is fashioned from a piece of cedar and is the first one that has been recorded as having come from the West Indies. Evidencing as it does the form of paddle in use by the natives before the time of Columbus it is of special interest to the layman as well as to the student. The kitchen-middens of Jamaica, the caves in the eastern part of Cuba, the caves and middens of Santo Domingo, the village sites of Trinidad and of the Dutch islands of Oruba, Curaçoa, and Buen Ayre, near the coast of Venezuela, all have received the attention of this investigator, and many new forms and unique specimens have been added to the collections as a result of these explorations. One pottery figure from a cave in Santo

[1] See footnote 3, below.

Domingo is in the form of a hunchbacked man and is represented in a sitting posture. Originally it was no doubt seated on a stool, but no evidence of its remains was found in the cave. So far as known it is unique; the only similar specimen being one that was found in Santo Domingo and sent to Europe.

Dr. J. Walter Fewkes of the Bureau of American Ethnology in Washington, D.C., who has made a special study of West Indian cultures, visited St. Vincent in the interest of the Museum. He also visited many of the smaller islands and carried on explorations on the island of Trinidad. In the kitchen-middens of Erin Bay, Trinidad, he found pottery vessels and other objects, representative of the prehistoric culture of the island, that throw a new light on this particular area and the environmental influences that have affected it.

The archeology of the island of Cuba was practically unknown until Mr. M. Raymond Harrington, following Mr. De Booy's preliminary survey, began his investigations in the caves and middens of the Baracoa region on the east coast of the island. Pottery vessels, which at that time were represented by only a few specimens in the museums of this country, were found in great numbers, many of them being in a perfect state of preservation. These, with fetiches, cave idols carved in the solid rock, carvings in stone, shell, bone, and wood, and various objects of a utilitarian nature have furnished the much-needed material for comparative studies of Carib and Arawak productions as shown by the various islands.

The main object of these extended investigations is the scientific assembling of facts relative to the manner of inhumations, the stratification of refuse heaps, which may be indicative of widely separated periods of occupancy, and the artifacts from each cultural area. The extension of the South American work to the coastal regions of Venezuela and the Guianas will probably complete the areas from which material is needed for a comprehensive comparison of forms. This should show the mainland influences on the island cultures and possibly indicate the early migrations and the home centers from which came the natives who took up their abode in the various islands of the Greater and the Lesser Antilles.

For several years Mr. Harrington was engaged in ethnological field researches for the Museum. His work among the southern tribes, including the Seminole, Choctaw, Creeks, Cherokee, Chitimacha, Huma, Alibamy, and Catawba, and among the western tribes, including the Delaware, Osage, Shawnee, and other tribes in Oklahoma, the Fox, Sac and Fox, Kiowa, Kiowa Apache and Chirichua Apache and the Kickapoo in northern Mexico, has given the Museum a valuable series of ethnological specimens, including one of the most complete series of scalp, war, tattoo, and other bundles that have ever been brought together. The scalp bundle of the Osage is represented by several examples. It consists of an outer cover made of woven buffalo hair. This is generally tied with a thong of buckskin to which is

FIG. 9.

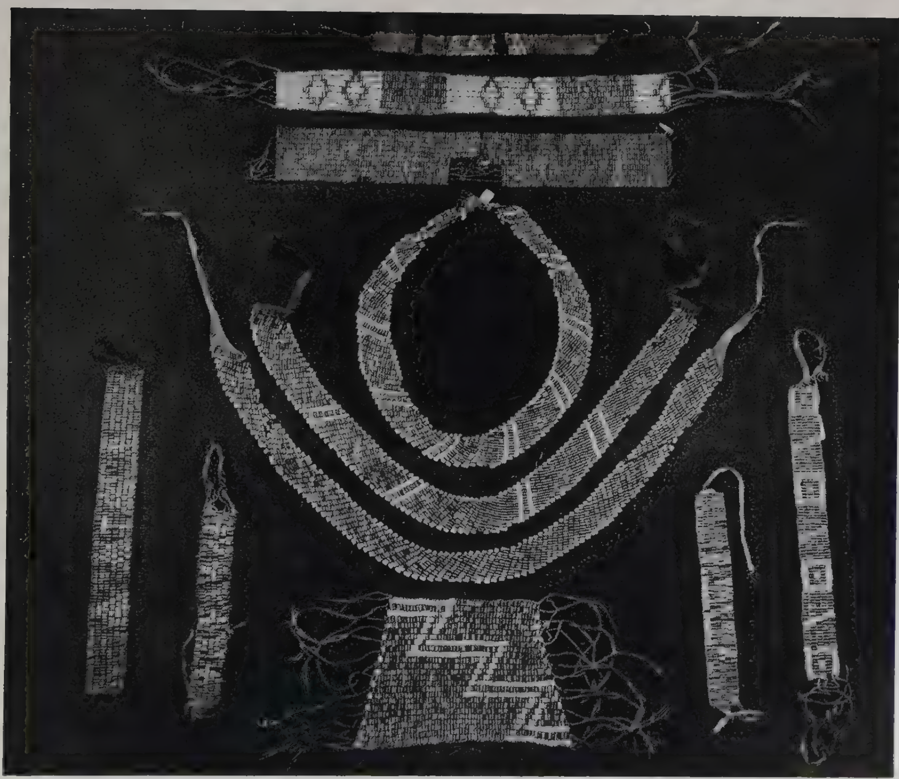

FIG. 10.

FIG. 9—Wampum belts made and used by the Iroquois and other Indians of the eastern part of the United States. The lower one is said to have been used in one of the treaties between the Delawares and William Penn.

FIG. 10—Wampum belts and necklaces and a wampum wristlet. The necklace shown in circular form is composed of glass beads made in imitation of the shell wampum; these beads date from the latter part of the eighteenth century.

attached an eagle leg and claw. Within the buffalo hair bag is a second bag, but this one is made of rushes: it has several buckskin receptacles containing tobacco and other material, but the object of special interest is the bag or pouch containing the war bird. This scalp-holder is the body of a hawk that has been stuffed. Its body is painted and it has a cord by means of which it may be carried. Attached to the band surrounding the hawk is a series of scalp fragments. These are all from human heads and each represents the death of some member of the Osage clan to whom the bundle belonged. When a clan member died it behooved the warrior members to kill an enemy in order that a piece of his scalp might be obtained and assurance given to the spirit of the deceased that he would have company on his journey to the spirit world. Aside from the ceremonial value and historic interest of these bundles they present one of the most interesting evidences of the utilization of the hair of the buffalo in the manufacture of bags; they are perhaps the best examples of this class of work extant.

The ceremonial bundles are repositories for much of the old material that illustrates the esthetic attainments of the early days. Ceremonial objects that, under normal conditions, would have been worn out or destroyed are therein preserved in their original condition. Delicate network made of buffalo-hair cord, snake and other skins embellished with porcupine-quill designs and wonderful quilled belts embodying in their designs the figures of men and animals are a few of the objects that would have been lost to the scientific world had they not been carefully preserved in the skin-wrapped bundles. Mr. W. C. Orchard, head technician of the Museum, who studied porcupine-quill work among the Sioux Indians, utilized many of the techniques found on specimens in the ceremonial bundles in his recent monograph on the technique of porcupine-quill work, which was published by the Museum. These bundles, as well as the moisture-proof caves, have proved to be storehouses of untold riches without which the field of supposition and analogical resort would have been immeasurably greater.

In the summer of 1914, Mr. George G. Heye and the writer explored the ancient council village of the Minisinks near the town of Montague in Sussex County, New Jersey. The cemetery contained over sixty burials, and, although Iroquoian influence was in evidence, much Algonquian material was found. With the bodies were pottery vessels and pipes, bird and animal forms in shell, also objects that showed contact with the early settlers. In the fall of the same year, after the completion of the Minisink work, field operations were transferred to the western part of New York state, where two cemeteries and a large kitchen-midden were explored.

In the spring of 1915, Mr. Heye opened a mound near the town of Canton in Jefferson County, North Carolina; and during the summer and fall of the same year the great Nacoochee mound in White County, Georgia, was explored. This rather extended work was in charge of Mr. Heye, Mr.

F. W. Hodge, of the Bureau of American Ethnology, and the writer. Most interesting and valuable specimens were obtained in this earthwork, including a large series of pipes, an unusual pottery jar in the shape of a dog, and an axe of native copper which is still held firmly in place in the original wooden handle. This specimen was found at the base of the mound, eighteen feet below the surface, and is, so far as known, the only one that has been found in this country. During the present year M. R. Harrington, assisted by Alanson Skinner, Edwin Coffin, and Charles Turbyfill, of the Museum staff, has been engaged in the work of excavating a number of prehistoric mounds and burial places in the vicinity of Ozan and Washington, in Hempstead County, Arkansas, and many unusual ceramic forms were found.

Collections

Among the noted collections that have helped to form the Heye collection is the one brought together by Dr. Joseph Jones of New Orleans. The purchase of this material placed in the Museum most of the type specimens that were figured and described by Doctor Jones under the title "Explorations of the Aboriginal Remains of Tennessee."[2] Made in the early days when good material was procurable and when the smaller mounds of the South had not been rifled, it contained specimens that have never been duplicated. It is particularly rich in material from the Southern states, but, as a consequence of Doctor Jones's omnivorous collecting activities, Mexico, Honduras, Costa Rica, and other regions are represented by stone sculptures and other specimens of note.

Other large collections that have helped greatly in the work include that brought together by the Rev. Mr. Crosby, which was rich in fighting head-dresses of the Tsimshian and Haida; that of Joseph Keppler, containing Iroquoian material, especially masks, wampum belts and strings, also clothing and objects of personal adornment; the Mrs. Thea Heye collection, consisting of selected specimens of old ethnological material from the North American Indians, also a large collection of pipes from the Middle West and various rare forms and general archeological material from the greater part of the United States and Mexico, especially from New Mexico and Utah; the H. K. Deisher material, consisting of specimens obtained from the mounds at Stockton, California, also a large amount of general archeological material; the major part of the Col. Bennett H. Young collection of Kentucky artifacts, including the large series of moccasins and other objects of a perishable nature from Salts, Mammoth, and other Kentucky caves, his entire collection of Kentucky pottery, and other specimens, including most of his pipes and a large wooden figure of a man that was found in a Kentucky cave.

Other acquisitions were the Albert C. Addis collection, which was rich in ceremonial archeological specimens from the United States and contained

[2] *Smithsonian Contributions to Knowledge 259* (Vol. 22, Art. 2), 1876.

the greater part of the Francis Cleveland collection of pipes, which for many years was exhibited in the museum of the Ohio State University at Columbus, Ohio; and the various collections of Northwest Coast materials brought together by Lieut. G. T. Emmons, including a large series of pipes and other specimens from the Haida, Tlingit, Tsimshian, Niska, and other tribes, also a representative collection from the Tahltan tribe of Alaska. An extremely valuable addition was the material consisting of over a hundred prehistoric mortuary and other pottery vessels from southern California, representing many years of work on the part of E. H. Davis, from whom they were obtained. Recent additions include the Minor C. Keith Costa Rican pottery collection, which embraces over ten thousand specimens from the east coast of Costa Rica; the noted Lady Blake collection of West Indian archeology; the collection of ivory implements and ornaments of the Eskimo and tribes of the Northwest Coast from J. E. Standley; the L. F. Branson collection of pottery and shell ornaments from Yell County, Arkansas; and the A. H. Blackiston collection of Mexican and Central American material that for a number of years was exhibited in the National Museum in Washington, D.C. It contains a wooden mask covered with a mosaic of turquoise, from Honduras, also a large series of pottery vessels from the ruins of Casas Grandes in the state of Chihuahua, Mexico.

Smaller collections in great number and in many instances the purchase of individual specimens have, with the results of expeditions, brought the Heye collection to its present exceptional scientific and numerical strength.

Aims of the Museum

The success of the Heye Museum—the title of the institution prior to the present foundation—is due to the early decision to exclude all foreign specimens and to assist other organizations. The vital interest in the work shown by Mr. Heye, his unflagging energy, his determination to uphold and develop his ideals, and his goodfellowship and *camaraderie* in the everyday work of the Museum have forged his links of hope into a strong chain of reality. The founding of the Museum of the American Indian marks the end of personal effort and opens up a broad field wherein all who are interested in the American Indian can work. Up to the time of the consideration of the present institution, all of the funds for the furtherance of the work, including expeditions, publications, the purchase of collections, and museum maintenance, were furnished by Mr. Heye and his mother, Marie A. Heye, who, up to the time of her decease, was a constant source of inspiration and whose kindly interest was reflected in the great financial aid that she gave to the project.

The results obtained, as a natural sequence, brought the Heye Museum to a position where it needed the help that only organized effort could give. The bringing together of certain individuals who are interested in museum work and who were most favorably impressed with the idea of having a

museum unique in the annals of the country, one that would be devoted exclusively to the American Indian, marked the beginning of the new institution. Mr. Heye agreed to turn over his collections, amounting to over 400,000 specimens, to a board of trustees, and Mr. Archer M. Huntington agreed to deed to the trustees the plot of land on the southeast corner of 155th Street and Broadway, New York City. The architect's elevation drawing shows the museum as it will appear when completed. It will be 65 feet wide and 125 feet in length and will contain four stories and basement. The cost of the building will be about $250,000, the greater part of which has been furnished by the trustees and their friends. The foundation is practically completed, and the building should be finished some time during the coming spring.

The new museum will continue the work of collecting and preserving for future study the esthetic, utilitarian, and ceremonial objects of the tribes of North, South, and Central America, and the West Indies. Special efforts will be made in the direction of locating perishable objects and endeavoring to obtain them for the Museum. A new department, that of Physical Anthropology, has been organized; it will be carried on under the direction of Dr. James B. Clemens, who will be assisted by Dr. Bruno Oetteking, and in the future all skeletal material from expeditions and from other sources will be preserved in the Museum.

The scientific collections will be displayed in cases in such a way that each group will tell a story that will appeal to the general public as well as to the scientist. The main exhibition halls will be devoted to this class of presentation, and in the basement there will be a systematically developed and carefully arranged study collection, where large series of most of the typical forms of each culture area may be seen and examined at leisure.

The publication work started by the Heye Museum has been continued and several monographs have been published under the auspices of the new institution.[3] This work will be extended and will present to the public the

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[3] The following is a complete list to date of the publications of the Museum:

The George G. Heye Expedition: Contributions to South American Archeology.

Vol. 1. The Antiquities of Manabi, Ecuador: A Preliminary Report. By Marshall H. Saville, 1907.
Vol. 2. The Antiquities of Manabi, Ecuador: Final Report. By Marshall H. Saville, 1910.

Contributions from the Heye Museum.

Vol. 1, No. 1: Lucayan Artifacts from the Bahamas. By Theodoor de Booy. Reprinted from *Amer. Anthropol.*, Vol. 15, 1913, No. 1.

No. 2: Precolumbian Decoration of the Teeth in Ecuador, with some account of the occurrence of the custom in other parts of North and South America. By Marshall H. Saville. Reprinted from *Amer. Anthropol.*, Vol. 15, 1913, No. 3.

No. 3: Certain Kitchen-Middens in Jamaica. By Theodoor de Booy. Reprinted from *Amer. Anthropol.*, Vol. 15, 1913, No. 3.

No. 4: Porto Rican Elbow-Stones in the Heye Museum, with discussion of similar objects elsewhere. By J. Walter Fewkes. Reprinted from *Amer. Anthropol.*, Vol. 15, 1913, No. 3.

No. 5: Note on the Archeology of Chiriqui. By George Grant MacCurdy. Reprinted from *Amer. Anthropol.*, Vol. 15, 1913, No. 4.

No. 6: Petroglyphs of Saint Vincent, British West Indies. By Thomas Huckerby. Reprinted from *Amer. Anthropol.*, Vol. 16, 1914, No. 2.

No. 7: Prehistoric Objects from a Shell-Heap at Erin Bay, Trinidad. By J. Walter Fewkes. Reprinted from *Amer. Anthropol.*, Vol. 16, 1914, No. 2.

No. 8: Relations of Aboriginal Culture and Environment in the Lesser Antilles. By J. Walter Fewkes. Reprinted from *Bull. Amer. Geogr. Soc.*, Vol. 46, 1914, No. 9.

No. 9: Pottery from Certain Caves in Eastern Santo Domingo, West Indies. By Theodoor de Booy. Reprinted from *Amer. Anthropol.*, Vol. 17, 1915, No. 1.

results of field explorations, general archeological and ethnological studies, and the results of technological researches. The expansion of this educational work in the form of lectures and the availability of specialists to whom the student may go for facts not brought forth by the exhibits, in connection with the large general and specialized libraries, will tend to make the Museum a center for those who are interested in America and the American Indian.

The Board of Trustees of the new Museum includes George G. Heye, Chairman; Harmon W. Hendricks, Vice-Chairman; Archer M. Huntington, James B. Ford, Minor C. Keith, and F. Kingsbury Curtis. Mr. Heye will be the Director of the Museum, Mr. Curtis the Treasurer, and Mr. F. K. Seward the Secretary.

Since the foundation of the new Museum, members of the Board and others who are interested in the institution have donated several valuable collections. Thus, from a private undertaking, superintended and financed by an individual, it has become a great public benefaction—a benefaction that needs the assistance of all who are interested in the preservation of material that will help to a better understanding of the primitive tribes of the two Americas.

Footnote 3, continued—

Contributions from the Museum of the American Indian, Heye Foundation.

Vol. 2, No. 1: Exploration of a Munsee Cemetery near Montague, New Jersey. By George G. Heye and George H. Pepper. 1915.

No. 2: Engraved Celts from the Antilles. By J. Walter Fewkes. 1915.

No. 3: Certain West Indian Superstitions Pertaining to Celts. By Theodoor de Booy. Reprinted from *Journ. Amer. Folk-Lore*, No. 107, Vol. 28, 1915.

No. 4: The Nanticoke Community of Delaware. By Frank G. Speck. 1915.

No. 5: Notes on the Archeology of Margarita Island, Venezuela. By Theodoor de Booy. 1916.

No. 6: Monolithic Axes and Their Distribution in Ancient America. By Marshall H. Saville. 1916.

Vol. 3: Physical Anthropology of the Lenape or Delawares, and of the Eastern Indians in General. By Aleš Hrdlička. (*Bur. of Amer. Ethnol. Bull. 62*, 1916, with added title-page and cover.)

Vol. 4, No. 1: The Technique of Porcupine-Quill Decoration among the North American Indians. By William C. Orchard. 1916.

GEOGRAPHIC INFLUENCES IN BRITISH ELECTIONS*

By EDWARD KREHBIEL
Leland Stanford Junior University

[With separate map, Pl. V, and key facing p. 432.]

That the factors which determine human desire and action are many and complex is a commonplace. Often enough the only motive force behind man's action seems to be public opinion. This public opinion is at best vague; and thus far no better means has been discovered for ascertaining what it is than elections. Among the many elements which determine political preference there are always the natural influences, and the problem of these pages is whether natural influences leave any tangible or measurable mark on elections in Great Britain. It must be recognized at the outset that one cannot hope for finality in such an enterprise, for, assuming that a group of voters does exhibit clear preferences, it is still a question whether these tendencies result from given natural conditions of environment or from artificial influences. The best one can do is to state the influences, natural and others, as far as they are ascertainable.

It is important to distinguish between natural and economic influences. Economic influences often result from geographic or natural environment; but quite as often they are the result of conditions created by man. Obviously the former, and not the latter, are among the natural forces here meant.

Nothing worth while can be expected from the study of a single election, as the chance of error is prohibitive. But this chance decreases with a multiplication of elections, as each checks up the other and serves to give control of recurrents and variables. The test, then, should rest on many elections, a demand that is not easily met, as election methods and districts have changed so frequently as to offer no long period for study. In the case of Great Britain the present system runs back to 1885, since which there have been the eight general elections upon which this study rests.[1]

*I wish to acknowledge my indebtedness to the following members of my Seminar, History 32, 1913-1914, for valuable aid in the preliminary studies to this map:

S. J. Campbell, George Ingelow, E. J. Oberle, Nellie Allen, Helen Bordwell, LeRoyce Downing, Ileen Bullis (now Mrs. S. J. Campbell), Ila Combe, Nan Drury, Eileen Everett, Katrine Fairclough, Bessie T. Ferguson, Margaret Girdner, Marjorie Haight, Effie Hawkins, Petra Johnston, Helene Montague, Evelyn Saylor, Callie Smith, Edith Smith, Katherine Voris.

[1] The results of these elections are here given in compact form:

	1885	*1886*	*1892*	*1895*	*1900*	*1906*	*Jan. 1910*	*Dec. 1910*
Conservative, or Unionist....	251	316	268	340	334	130	273	272
Liberal-Unionist............	..	77	46	71	68	27	..	..
Liberals (Gladstone Lib.)...	333	192	275	177	186	376	275	272
Irish Nationalists...........	86	85	81	81	82	83	82	84
Labor......................	..	..	..	..	..	54	40	42

Chapters 34-36 of Lowell's "The Government of England" are very useful in this connection.

The accompanying map (Pl. V) is based on the large-scale detailed maps submitted to Parliament by the Dilke Commission, to which had been assigned the redistricting of the country for electoral purposes.[2] The colors in the map represent the political tendencies of the several constituencies in the eight general elections under consideration.[3] Being a composite or summary, the map furnishes a basis for comparison with maps showing occupations, land values, physical and geological features, density of population, and the like, with a view to discovering any significant correspondence.[4]

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[2] *British Parliamentary Papers*, 1884-85, Vol. 19 (Counties), Vol. 63 (Boroughs).

Of necessity many minor details do not appear in this reduction; but it contains all essentials and is as true to the original as its purpose requires. The only considerable variation is the introduction of circles into the map in order to provide color space for boroughs. As far as possible the centers of the circles coincide with the actual location of the boroughs they indicate. The symbols accompanying the map will explain all other features.

[3] No account is taken of the character of the victory in the several elections, that is, whether the victorious candidate won by a large or a small majority. Hence the conclusions drawn from these elections are open to the just criticism that they would be more reliable if they rested on the actual vote polled by each party. However, the same criticism may be leveled at Parliament. Inasmuch as Parliament is accepted as an adequate representation of popular will, the map, which adopts the same principle, has the same justification.

Space forbids more than the briefest note about English political parties. There are five prominent parties that have seated members since 1885:

1. The Conservatives, or Tories, who are the party of aristocratic and vested interests. They have opposed Home Rule for Ireland and hence have come to be called Unionists.
2. The Liberal-Unionists, who, though having Liberal tendencies, are opposed to Home Rule. They appeared in the election of 1886 after Gladstone had come out for Home Rule.
3. The Liberals, who seek a greater measure of popular rights and control at the expense of the aristocratic group and who have favored Home Rule. They were for a while called Gladstone Liberals.
4. The Labor Party, which, though more radical, has often co-operated with the Liberals. Its influence is too recent to show in a map of this character.
5. Nationalists, the Irish party demanding Home Rule.

[4] The data for this work are drawn from the British Parliamentary Papers listed below, which give the names of candidates and the election results; they do not give the party affiliations of the candidates. The material for the latter is taken from Hazell's Annuals as shown below, the Annual containing the party affiliations as compiled by the *London Times*. To avoid confusion it should be noted that in a few cases the list given in Hazell contains the results of bye-elections following hard upon general elections; in such instances the results of the general elections, which are the only ones considered in this study, were checked up by means of the Parliamentary Papers.

General Election of 1885
- *British Parliamentary Papers*, 1886, Vol. 52, p. 199: Return of Charges Made to Candidates at the Late General Election, 1885.
- Hazell's Annual, 1886, pp. 491-510.

General Election of 1886
- *British Parliamentary Papers*, 1886, Vol. 52, p. 45: Return of Charges ... at the Late General Election, 1886.
- Hazell's Annual, 1887, pp. 254-327.

General Election of 1892
- *British Parliamentary Papers*, 1893-94, Vol. 70, p. 423: Return ..... Election, 1892.
- Hazell's Annual, 1893, pp. 175-186 (contains bye-elections).

General Election of 1895
- *British Parliamentary Papers*, 1896, Vol. 67, p. 145: Return ..... Election, 1895.
- Hazell's Annual, 1896, pp. 167-176 (contains bye-elections).

General Election of 1900
- *British Parliamentary Papers*, 1901, Vol. 59, p. 352: Return ..... Election, 1900.
- Hazell's Annual, 1901, pp. 170-180.

General Election of 1906
- *British Parliamentary Papers*, 1906, Vol. 96, p. 302: Return ..... Election, 1906.
- Hazell's Annual, 1907, pp. 416-426.

General Election of January, 1910
- *British Parliamentary Papers*, 1910, Vol. 73, p. 299: Return ..... Election, January, 1910.
- Hazell's Annual, 1911, pp. 106-117.

General Election of December, 1910
- *British Parliamentary Papers*, 1911, Vol. 62, p. 272: Return ..... Election, December, 1910.
- Hazell's Annual, 1911, pp. 369-382.

To do this effectively the whole country was divided into sections. Thus Ireland, Scotland, and Wales for natural and historical reasons are considered separately. England is partitioned according as there are extensive blocks of the same color indicating the predominance of a given party in the region. These sections are shown on Figure 1 as follows: (I) Southwestern England, (II) Southern England, (III) Western England, (IV) Central and Eastern England, (V) Strip across England containing the West Riding of York,[5] (VI) Strip parallel to the above containing the North and East Ridings of York,[5] (VII) Northern England.

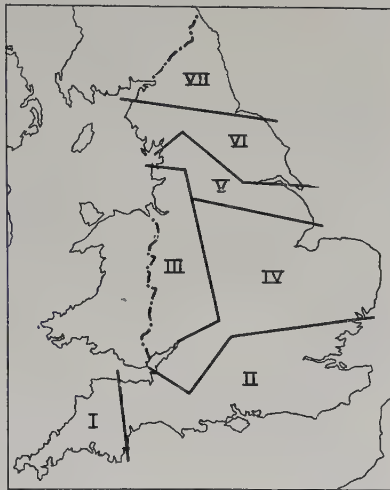

FIG. 1—Outline map showing the sections into which England has been divided for the purposes of this paper according to the predominance in each of a given political party. For key, see the text.

County Constituencies

An almost obvious principle greets us at the very outset, that the Liberal portions of England (colored yellow on Pl. V) are the industrial regions. This is fully confirmed by the occupation statistics in the British census reports.[6] These show that in 1911, in England and Wales, the average proportion of males engaged in certain occupations selected arbitrarily as useful for comparison was as follows:

1. Domestic indoor service (in homes, clubs, hotels, boarding-houses, hospitals, lodges, baths, laundries, etc.)	118 per 10,000
2. Domestic outdoor service (coachmen, grooms, chauffeurs, footmen, domestic gardeners, and gamekeepers)	166 " "
3. Commercial occupations (merchants, clerks, dealers in money, insurance men)	486 " "
4. Agriculture	835 " "
5. Mines (workers in and about mines)	739 " "
6. Metal trades (machine making, iron, steel, etc., electrical apparatus, shipbuilding, vehicles)	1,050 " "
7. Textile trades (manufacture, bleaching, dyeing, printing, etc., of textiles)	344 " "

Incorporating these averages into a table showing the occupations of the Liberal parts of England (Sections I, V, and VII) it will be found that invariably the industrial occupations run above the normal.

[5] North Riding embraces the constituencies of Richmond, Cleveland, Whitby, and Thirsk and Malton; East Riding embraces Buckrose, Holderness, and Howdenshire; and West Riding the remaining constituencies composing Yorkshire, except the city of York (see the list inserted before Pl. V).

[6] *British Parliamentary Papers*, 1913, Vol. 78 (Cd. 7018), p. 496, Table 22A.

TABLE I—OCCUPATIONS IN THE LIBERAL SECTIONS OF ENGLAND

OCCUPATION	AVERAGE PER 10,000	CORNWALL	DEVONSHIRE	W. RIDING YORK
Indoor domestics	118	78	128	61
Outdoor domestics	166	161	362	111
Commercial	486	197	207	285
Agriculture	835	2,030	2,392	666
Mines	739	1,146	144	2,132
Metal trades	1,050	481	320	1,061
Textile trades	344	23	58	1,261
Enclosures (according to Slater)	....	0	0	11.6%

OCCUPATION	AVERAGE PER 10,000	NORTHUMBERLAND	CUMBERLAND	DURHAM
Indoor domestics	118	56	54	36
Outdoor domestics	166	175	140	56
Commercial	486	276	253	214
Agriculture	835	935	1,543	327
Mines	739	3,392	1,595	3,901
Metal trades	1,050	949	795	1,403
Textile trades	344	13	125	9
Enclosures (according to Slater)	....	1.7%	1.1%	.7%

Considering first the West Riding of York (Section V), the very stronghold of English Liberalism, it appears that mining, metal, and textile trades are much above the normal, whereas agriculture is lower. Without exception the county constituencies show a preference for Liberal or Labor candidates. Northern Lincoln, in which great ore beds are now being developed, and Lancaster constituency of Lancashire, in which there are great manufactories, especially of linoleum, are also Liberal.

Northumberland and Durham (Section VII) with their vast coal and iron trades are pronouncedly Liberal; Cumberland, somewhat outside of the great industrial centers, still has an industrial majority and shows preference for Liberals; though Egremont, because it is wholly outside the industrial region, is also outside of the Liberal sphere.

Both Cornwall and Devonshire (Section I) show a preponderance of agriculture over industry and yet are Liberal, thus apparently contradicting the thesis that Liberal districts imply the presence of a laboring class. One has, however, but to consult a map showing the commercial and industrial districts of England to see that the rule is fully confirmed by the facts.[7] In Cornwall and Devonshire, the Liberal majorities lie precisely in the copper and tin mine and the quarry districts. That the other constituencies are mainly Liberal, though according to the census agriculture is their chief occupation, is probably attributable to the inhospitable character of the peninsula, jutting so boldly into the sea and containing the hill regions of Exmoor and Dartmoor. For this is an appropriate place to call attention to the fact that poor agricultural regions show a preference for Liberal candidates. On the contrary, Honiton and Tiverton, the good farming regions of Devonshire, in which the bulk of the agricultural population lives, are Conservative.

[7] Bartholomew's Survey Atlas of England and Wales, Plate 11.

FIG. 2—Map of the coalfields of Great Britain. Scale, 1:4,500,000. Based, for England and Wales, on Map 29 in atlas of report to the Twelfth International Geological Congress, 1913, on "The Coal Resources of the World"; for Scotland, on map in Edward Hull's "The Coal-Fields of Great Britain," 5th edit., 1905. Nomenclature used is derived from both these sources.

Key to coalfields: 1, Clackmannan; 2, Fifeshire; 3, Clyde Basin; 4, Lothians; 5, Ayrshire; 6, Lesmaha Co.; 7, Straiton; 8, Northumberland and Durham; 8a, Cumberland; 9, Ingleton; 10, Lancashire; 11, Yorkshire; 12, Derbyshire; 13, Flintshire; 14, Denbighshire; 14a, Anglesey; 15, North Staffordshire; 15a, Shropshire; 16, South Staffordshire; 17, Warwickshire; 17a, Leicestershire; 18, South Wales; 18a, Pembrokeshire; 19, Forest of Dean; 20, Bristol.

Summarizing: When the laboring class is most numerous in a county constituency the chances are that it will incline to the Liberal or Labor party. The same is true of those constituencies in which rural or agricultural interests predominate, if the farm lands are inferior in quality or if the farmers are themselves small landholders.

The principles just stated for the greater part embody an environmental or natural influence on man in his political action. Geological and other natural factors, such as ore and coal deposits (see map, Fig. 2), waterways, and soil conditions, have governed the distribution of the population and have contributed to creating some of the issues which appear in politics. In this sense we have geographic factors by creating economic and social issues exercising a real influence in politics.

In England, however, the natural are greatly complicated by artificial factors, as will appear from a study of conditions in Conservative England (Sections II, IV, VI).[8] In all of these there is similarity of occupations and conditions: all are agricultural and grazing regions, all show a considerable though varying servant class, and in all great private estates are extensive.

The statistics upon occupations drawn from the census reports reveal that there are four types of counties in the Conservative sections of our map (colored blue): those in which agriculture distinctly predominates (Kent, Dorset, North Riding of York, etc.); those in which commercial occupations run high (Middlesex and Surrey); those in which agriculture and industry run relatively even (Wiltshire, Worcester, Chester); and one in which industry predominates (Lancaster).

In the counties of the Kent group, in which agriculture is the chief occupation, it also appears from Table II that domestic indoor and outdoor service is relatively abundant, implying a wealthy class which maintains servants. This is further borne out by the circumstance that, though the land is highly suited to mixed agriculture, a smaller proportion of it is under cultivation than in eastern England north of the Thames.[9] Pasture land, conversely, is more abundant than in the region north of the Thames, running in some parts up to forty and fifty per cent of the area, and grazing is an important industry.

This fertile region of England is one of the strongholds of the landed aristocracy. The abundance of pasture lands signifies the presence of extensive enclosures, or great private estates of wealthy landlords. In this part of England the titles to estates run back into medieval days[10] and there

[8] Conspicuous among the artificial influences in British elections is the Home Rule question, which has been paramount since the election of 1886. The extent of this influence is best manifested by the strength of the Liberal-Union Party, which was created by opposition to Home Rule.

[9] Bartholomew's Survey Atlas of England and Wales, maps on Plate 3.

[10] The percentage of enclosures given in Table II are from Gilbert Slater: The English Peasantry and the Enclosure of Common Fields, London, 1907, pp. 140-147. Slater's work, however, deals merely with enclosures occurring during the seventeenth and eighteenth centuries; his figures do not account for enclosures in earlier periods, and hence are not to be taken as totals for the counties of southern England, in which the titles to estates date back into the feudal era.

TABLE II—OCCUPATIONS IN THE CONSERVATIVE SECTIONS OF ENGLAND

Occupation	Average per 10,000	Essex	Kent	Sussex	Hertford	Buckingham	Berkshire
Indoor domestics	118	118	153	455	177	149	240
Outdoor domestics	166	171	285	1,652	527	499	828
Commercial	486	868	351	393	467	230	217
Agriculture	835	1,121	1,245	4,436	1,525	2,118	1,974
Mines	739	16	57	67	20	12	12
Metal trades	1,050	631	714	553	380	702	346
Textile trades	344	23	15	33	7	7	9
Enclosures (according to Slater)	....	2.2%	0	1.9%	13.1%	34.2%	26.0%

Occupation	Average per 10,000	Hampshire	Dorset	Somerset	Surrey	Middlesex	Wiltshire
Indoor domestics	118	151	120	92	251	151	106
Outdoor domestics	166	506	401	339	599	128	377
Commercial	486	174	204	284	720	1,004	190
Agriculture	835	1,543	2,011	2,151	819	354	2,253
Mines	739	13	197	498	27	10	83
Metal trades	1,050	590	351	396	377	638	1,211
Textile trades	344	4	75	151	13	4	83
Enclosures (according to Slater)	....	6.4%	8.7%	3.5%	6.4%	19.7%	24.1%

Occupation	Average per 10,000	Monmouth	Worcester	Shropshire	Chester	Lancaster
Indoor domestics	118	37	86	102	89	72
Outdoor domestics	166	101	248	377	271	90
Commercial	486	185	542	234	649	441
Agriculture	835	606	1,335	2,422	1,085	587
Mines	739	4,225	121	645	134	1,158
Metal trades	1,050	974	1,853	841	1,075	891
Textile trades	344	3	231	35	678	1,983
Enclosures (according to Slater)	....	.4%	16.5%	.3%	.5%	0

Occupation	Average per 10,000	Stafford	N. Riding York	E. Riding York	Westmorland
Indoor domestics	118	52	88	88	82
Outdoor domestics	166	151	304	304	410
Commercial	486	352	260	260	232
Agriculture	835	773	3,658	3,658	2,538
Mines	739	1,563	34	34	213
Metal trades	1,050	2,196	381	381	366
Textile trades	344	96	65	15	144
Enclosures (according to Slater)	....	2.8%	6.3%	40.1%	.6%

still exists a feudal atmosphere, observable chiefly in the deference of the common people toward the landlords. It is no wonder they are subservient, for they are tenants with leases running normally for one year and with inadequate legal means of recovering costs of improvements if renewal of the lease should suddenly be refused. Quite intelligible is it also that they vote for Tory candidates and that so frequently the elections in these parts are not even contested.

In Surrey, agriculture stands out less prominently than in other counties and is approached by commercial occupations; and in Middlesex commercial occupations far outrank all others. The explanation for this is, of course, that the London boroughs lie chiefly in these two counties and that suburban conditions are characteristic. The portions outside of the metropolitan sphere are, like the rest of southeastern England, controlled by the landed aristocracy, and are Conservative.

Counties of the third type, in which agriculture and industries both figure prominently as occupations, do not militate against the tendencies already discovered. To illustrate: In Worcestershire, the southern constituencies, in which the agricultural population lives, are pronouncedly Conservative. The industrial population is found in the northern constituencies in the vicinity of Birmingham, and its political reactions are away from Toryism. In Wiltshire the three constituencies showing a preference for the Conservatives are agricultural. The other two go Liberal: one, Westbury, contains the industrial centers east of Bath; the other, containing Marlborough Downs, is in parts a poorer agricultural region. Similarly with Chester. The larger constituencies lie in the rich Cheshire Plain and return Conservative members to Parliament. The smaller and hence more heavily populated districts lean toward the Liberals. Wirral, despite its large industrial population, is Conservative, because it contains the country seats of rich Liverpool merchants and because the Lairds (of Cammel Laird and Company) have used their power over their employees to secure a Tory vote.

The same precisely is true of Lancaster, in which, as has already been noted, the industrial elements greatly predominate. A careful study of the map shows that the country constituencies of Lancaster (the boroughs are considered elsewhere) are of two kinds: those having a small area that is densely inhabited and the large districts, relatively sparsely populated. The latter, which lie in the western part of the shire, are with a single exception preponderantly Conservative; which is to be expected, as they are agricultural districts and contain the estates of wealthy Catholic Tories. Conspicuous among the landlords of this region are Lords Sefton and Derby, the latter of whom controls Bootle constituency. The more densely populated districts, which lie in the coal region, favor the Liberal or the Labor parties. In no instance do the Conservatives prevail. The predominance of the Conservatives in Lancaster is therefore more apparent than real;[11] in fact, Lancaster has but to be broken into its true divisions to behave like any other part of England; the eastern part of the shire is industrial and Liberal or radical, is, in short, a continuation of the West Riding of York; the western part of the shire, with its landed gentry, is Conservative.

Central and Eastern England (Section IV on Fig. 1) seems mottled (on Pl. V), and it appears hopeless to seek an explanation for so miscellaneous a district. However, the principle just applied elsewhere, that industrial communities are predominantly Liberal in politics, holds true here quite as well. The Liberal parts of Monmouth, Gloucester, Oxford,

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[11] The circumstance that on the map Lancaster appears almost wholly blue (Conservative) is one of the deceptions which must be guarded against. It arises from the accident that, though both have equal value in representation, the Tory districts are large and the Liberal are small, and the blue is therefore more conspicuous.

Warwick, Buckingham, Northampton, Leicester, Derby, Nottingham, and, as already noted, of Lincoln, all contain large labor populations.

TABLE III—OCCUPATIONS IN PART OF CENTRAL AND EASTERN ENGLAND

OCCUPATION	AVERAGE PER 10,000	MONMOUTH	GLOUCESTER	OXFORD	WARWICK	BUCKINGHAM
Indoor domestics	118	37	113	155	93	149
Outdoor domestics	166	101	416	581	285	499
Commercial	486	185	241	198	420	230
Agriculture	835	606	1,974	2,935	1,143	2,118
Mines	739	4,225	699	49	1,054	12
Metal trades	1,050	974	517	378	1,377	346
Textile trades	344	3	117	113	48	9
Enclosures (according to Slater)	....	.4%	22.5%	45.6%	25.0%	26.0%

OCCUPATION	AVERAGE PER 10,000	NORTHAMPTON	LEICESTER	DERBY	NOTTINGHAM	LINCOLN
Indoor domestics	118	102	97	60	66	39
Outdoor domestics	166	333	295	134	185	103
Commercial	486	204	241	257	305	179
Agriculture	835	1,966	1,492	813	1,230	4,428
Mines	739	323	1,335	2,906	2,530	2
Metal trades	1,050	516	677	840	673	297
Textile trades	344	2	643	590	378	9
Enclosures (according to Slater)	....	51.5%	38.2%	15.9%	32.5%	29.3%

Bedford, Cambridge, and Norfolk seem to run counter to this rule, for in each the agricultural class is preponderant. To be sure, in Bedford there is a considerable industrial class, engaged in the manufacture of straw hats and bonnets, for which Luton is famed.[12] But the real reason

TABLE IV—OCCUPATIONS IN PART OF CENTRAL AND EASTERN ENGLAND

OCCUPATION	AVERAGE PER 10,000	BEDFORD	CAMBRIDGE	NORFOLK
Indoor domestics	118	97	266	93
Outdoor domestics	166	222	301	439
Commercial	486	240	233	145
Agriculture	835	1,957	3,011	3,935
Mines	739	57	14	26
Metal trades	1,050	986	309	370
Textile trades	344	18	7	14
Enclosures (according to Slater)	....	46.0%	36.3%	32.3%

why these agricultural areas are Liberal is that they are filled with small landholders or agrarians. These small landholders are often prosperous, for the soil of the Fenlands is the best there is in England; but they have not forgotten the enclosure acts of the last two centuries, and they voice their protest by voting the Liberal ticket. This region is also a strong center of Nonconformity, which strengthens the Liberal vote. And in Norfolk, where the soil is not so rich, there is again the modest farmer with his radical tendencies.

The enclosure acts just mentioned account for the strength the Tory party has always shown in northern Nottingham, western Lincoln, eastern

[12] In Bedfordshire 603 per 10,000 males are engaged in straw hat making,—more than anywhere else in the country.

Leicester, Rutland, Huntingdon, upper Northampton, and in the inland districts of Norfolk and Suffolk. As already noted, in southeastern England the landlords secured their titles in feudal times. Not so in other parts of England, for in these the present titles to the great estates were secured through the Parliamentary enclosures acts of the eighteenth and nineteenth centuries. The districts affected by the enclosure acts are well shown by a map in Slater's instructive work on "The English Peasantry."[13] A glance at this map will show that most of the enclosures lie in that portion of England (Section IV) which is now under consideration.

The extent of these enclosures is nothing short of astounding, running up toward fifty per cent of the acreage in the region about Rutland.[14] In Northampton 51.5 per cent was taken from the commons and given to privilege. The condition thus produced is obviously highly artificial, and hence the influence it exercises on politics is likewise unnatural. There is, however, a natural feature in this connection that should not be overlooked, that in making these expropriations the beneficiaries everywhere selected the very best that nature had to offer, particularly in the Fens of the East Midlands.[15]

Once this selection was made, economic considerations became paramount; it became a problem of maintaining, if not extending, the estate. With the rise of liberal and anti-aristrocratic parties in the nineteenth century, the legal processes of enclosure came to an end, and with the passage of time there has developed an ever-increasing tension between the vested rights in lands and the other portions of the population, a tension which had arrived near to the breaking point when the great war intervened, and which may yet lead to intestine strife. The rival interests naturally appear in politics, and precisely in these regions of greatest enclosure the political rivalry between landlord and small landholder is keenest. Elections are often very close, and each party resorts to every known form of pressure, the Tories practically dictating the politics of their tenants and tradesmen. Their power may be seen very clearly by comparing the election maps of Norfolk and Suffolk with a map[16] showing the enclosures in those counties, from which it will appear that the Liberals are strongest in the constituencies in which the enclosed area is smallest.

In Wales a combination of circumstances returns a majority of Liberal and Labor candidates. In the first place there are the great mining and industrial areas of South Wales, and the minor lead and tin mines in other parts. By nature also the country is not adapted to agriculture, and here it is true as elsewhere that a hard life tends to produce radical thinking, a circumstance which accounts for the Welsh Agrarian Democrats. This

[13] Slater: work cited in footnote 10, map facing p. 73.

[14] Slater (*ibid.*, pp. 140-147) gives a table showing the percentage of the area of each county thus enclosed. These figures are incorporated in Tables I, II, III, and IV of this paper.

[15] *Ibid.*, map facing p. 196. It seems that with the change in agricultural methods many estates are no longer so valuable relatively as they were when enclosed.

[16] *Ibid.*, map facing p. 197.

tendency is aggravated by the pressure of landlordism, which makes Liberal tendencies more pronounced. Finally, there is the Nonconformist movement which demands the disestablishment of the Church in Wales and looks to the Liberals to bring it about. The educational system of Wales, which is superior to that of England, has also been a factor in determining the general result.

Scotland has steadily been loyal to the Liberal Party. Partly this is due to historical factors, the natural caution against too great a centralization of government in the once hostile England. As in Wales, there is a better system of education, and there is the fear of landlordism. Likewise in the highlands there are the crofters, who exhibit the hardy self-reliance and independence characteristic of mountain peoples. On top of all these factors the industrial populations strengthen Liberalism, for it is the labor constituencies about Glasgow, Edinburgh, and the eastern lowlands generally which most persistently return Liberal members.[17]

In Ireland the situation is reversed, for there the populous industrial regions of Ulster return Conservatives, while the more sparsely inhabited rural portions of the island return Nationalists. This situation is in part the result of circumstances notorious as the Ulster or Home Rule problem, which are man-made in the sense that they are the fruit of the penetration into a rural Catholic country of a privileged landed aristocracy, owing allegiance to the Church of England, and a wealthy class of Scottish Presbyterians, who developed the industry of Ulster. The religious and economic hostility of these groups accounts for politics in Ireland. It is, to be sure, pertinent to ask why the industrial population in those parts should not, as in England, be radical. The reason is that a considerable portion of the industrial class is Protestant—the Catholic or Irish population in Antrim, Armagh, Down, and Londonderry is less than fifty per cent—and votes with the dominant class, and, furthermore, that so far no attempt has been made to organize the industrial vote in opposition to the Tories. In not a few of these constituencies elections are uncontested. When contested they are invariably close, which gives color to the belief of some that if the Liberals organized and financed an opposition in Ulster they could win from six to ten additional seats.

There is, however, a natural condition which caused the concentration of the great industries of Ireland in Ulster, and that is the adaptability of this region, the only one of the kind in the British Isles, to the growing of flax. This accounts for the flax fields of Ulster and the great manufactories of Irish linen in Belfast.

Boroughs

Cities, being in a sense artificial, are more influenced by artificial than by natural causes in politics. To be sure there are geographical reasons

[17] *British Parliamentary Papers*, 1913, Vol. 80 (Cd. 6896), Census of Scotland, 1911, Table XXVII: Occupation of Males by Cities and Counties.

for the locations of cities which account for the great sea ports, the industrial, mining, or agricultural centers. However, these alone do not at all explain the political tendencies of communities.

In boroughs as in counties it is true as a fundamental principle that the laboring classes are radical in tendency and vote with the Liberal or Labor parties. In so far as natural features, such as ore deposits, water-power, or other geographic factors, contributed to creating labor centers, it may be said that natural conditions influenced politics. That laboring classes are ordinarily progressive or radical is known; but whether this tendency is an inevitable consequence of living in masses, or is merely the result of prevalent economic conditions, themselves in part the result of legislation, is not clear.[18] That the latter is a great factor is indisputable, as already illustrated by the political opposition of the small landholders of England to the privileged Tories.

The parliamentary boroughs of Scotland, Ireland, and Wales generally vote as do the contiguous county constituencies—that is, Liberal in Scotland and Wales, Tory in parts of Ulster, and Nationalist in the rest of Ireland—and for the same reasons.

In England industrial boroughs show a disposition to favor Liberal and Labor candidates, a disposition which often fails of effect, because of current election practices, such as the registration of votes, plural voting, and others. As for boroughs with traditional influences, such as cathedral and university cities, and boroughs within the pale of landlordism, they stand with the Tories.

Applying this generalization it will be seen that the smaller industrial boroughs of the West Riding of York, of Northern England, and of Central and Eastern England, such as Derby, Nottingham, Leicester, Northampton, Bedford, Bristol, Ipswich, and Norwich (in Section IV), as also Stafford, Stoke-upon-Trent, and Newcastle-under-Lyme, lean toward the Liberals.

The really surprising fact, however, is that so large a proportion of industrial boroughs are for the Tories. This is notably true of Liverpool, but it is conspicuous in all the large manufacturing centers,—Manchester, Sheffield, Leeds, and Birmingham, not to mention a number of smaller boroughs in Lancashire and Cheshire.

The explanation for this contradictory state of things is to be found in a number of artificial factors chiefly of a political nature, which reverse the natural tendencies. A summary of these factors is all that is pertinent here.

To vote in England one's name must appear on the register. To get on the borough register a lodger must have resided in the same quarters for twelve months and have paid a rental amounting to £10 for the year. With a year of residence and the time that may elapse before the legal process of inscribing the name on the register is complete, it may mean eighteen

[18] The exception in Ulster has just been noted and explained.

months of residence before one is qualified to vote. Obviously this provision eliminates transients, such as many laborers are bound to be. This £10 rental is not high, but it does eliminate all paupers, and with them a radical vote.

Another provision, now almost peculiar to England, is that a person may vote in every constituency in which he is qualified. This is plural voting. In the case of boroughs it means that one has but to maintain a legal residence, which is, in effect, paying £10 for lodgings, to be entitled to vote. Considering that the pollings in England do not, as in other countries, occur on one day, but may run over twelve, the significance of plural voting may be surmised.

The two factors noted operate to eliminate the poor man, the laborer, and to multiply the voting strength of the man of means, the Tory, thus making clear why so many constituencies return Conservatives when one would expect their political opponents to win.

The business and warehouse districts of English boroughs return Conservative members for the simple reason that the electoral system gives the property owners the predominance. If the property owners in the Wall Street district of New York, in which relatively few persons live, were to elect a representative, they would unfailingly choose a stand-patter. For similar reasons the Central constituencies of Glasgow, Sheffield, Leeds, and Birmingham, the Northwest of Manchester, and the City of London are Tory. Why Exchange constituency of Liverpool violated this rule is noticed below.

The Toryism of Liverpool is explained by local political conditions. The Tories have control of the municipal council, and they have used this control to meet the demands of the labor elements by passing surprisingly radical legislation. The effect has been to leave no room for a local opposition party, with the result that when it comes to national elections the Tories meet no real difficulty. Only in Scotland constituency, where the Irish dockers live, are the Tories outdone.

The political complexion of Birmingham and of neighboring boroughs is largely the result of the personal influence of the late Joseph Chamberlain and of his protectionist and Unionist policies. The Schnadhorst or Birmingham Caucus, Chamberlain's political machine, and one of the most powerful in Britain, has with scientific precision returned members pledged to oppose free trade and Home Rule for Ireland. The marvel of this achievement appears when it is noted that in 1885 every constituency of Birmingham stood for John Bright's free trade program. The city passed from Liberals to Liberal-Unionists, and of late has shown a tendency to out-and-out Unionist politics.

To 1906 Manchester was on the whole controlled by the Tories. But with the injection of protection into politics, the prosperity of Manchester, which depends on imported cotton, was threatened, and Tories joined

Liberals to uphold free trade; hence, since 1906 only one Conservative has been seated in a general election. Exchange constituency in Liverpool, which largely depends on cotton trade, reacted sympathetically and returned Liberals in two elections.

As has been noted, cathedral boroughs or those in Tory areas usually seat Conservatives. York is a notable exception. The simple reason is that there is a considerable industrial class in the city engaged principally in the production of foods and drinks, and especially of confectionery.[19]

The London boroughs follow the rules already laid down. Those containing the homes of the poorer classes (the crowded parts of Tower Hamlets,[20] Bethnal Green, Shoreditch, Islington, St. Pancras, Southwark, Newington, and Camberwell) all return Labor or Liberal members. Battersea has been carried by John Burns for the Labor party. The residential districts of London are strongly Conservative.

The university constituencies must be briefly mentioned. There are six of these, some with two seats: Oxford (two seats), Cambridge (two seats), London, Edinburgh and St. Andrews, Glasgow and Aberdeen, and Dublin (two seats). With the single exception of the University of London, which in 1885 returned a Liberal, university members have always belonged to the Conservative wing.

From the foregoing it is evident that geographical or natural factors have contributed very materially in creating the conditions which determine political predilections; and that a multitude of artificial factors have done likewise. It is true in some instances, if not in all, that the political devices of the vested interests have secured precisely the opposite product from that which would have resulted had matters been allowed to take their natural course.

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[19] Of the population of York over ten years old, 9.6 per cent. are engaged in the chocolate and cocoa trades. York is the seat of the great Rowntree chocolate works.

[20] The Conservative area in Tower Hamlets is a Hebrew quarter whose inhabitants are influenced in their politics by incompatibility with their neighbors.

THE CHURCHILL RIVER*

By FREDERICK J. ALCOCK
Geological Survey of Canada

Of the many rivers that flow into Hudson Bay, the second largest in size and one of the most interesting from a historical and geographical point of view is the Churchill. Discovered in 1619, it was used for over one hundred years as a trading route of the Hudson's Bay Company from their fort at its mouth to the interior. In the year 1821, however, it was abandoned so completely that, for a portion of its lower course, no information was available until it was mapped by the writer in 1915.

In many respects it is a river typical of the great northern interior portion of Canada, a river of rapids, falls, narrow chutes, broad lake expansions dotted with islands, and long, placid stretches of smooth water, a stream for travel by canoe only. Its length is approximately one thousand miles, and its basin occupies 115,500 square miles, an area greater than that of Italy and almost as large as that of Great Britain and Ireland. To the south of it is an area of 4,000 square miles at present a complete blank on the map, while to the north of it lies a region covering 73,000 square miles, totally unexplored by white men. The upper portion of its basin is much better known; it is more easily accessible, and as a result more survey work has been done there.

Early History and Exploration

The history of the region begins with the discovery of Hudson Bay. In 1610 Henry Hudson entered the bay and sailed its entire length to the head of James Bay. In the following year occurred his tragic death after being marooned in an open boat by his mutinous sailors. In 1612 Sir Thomas Button sailed along the west coast of Hudson Bay in search of a northwest passage to China and in vain hopes of finding some trace of Hudson. Button wintered at the mouth of the Nelson River and in the following spring sailed north along the coast past Cape Churchill. It remained, however, for a seaman of another nationality to discover the Churchill River and the best harbor on the west coast of Hudson Bay.

In the autumn of 1619, Jens Munck, a Danish sea-captain, sailed across Hudson Bay in search of the much-desired northwest passage, with two vessels, a war ship named the *Unicorn* and a small sloop, the *Lamprey*. Driven by a heavy gale Munck came to an opening between breakers on a rock-bound shore. He had discovered the large natural harbor of Churchill.

Munck spent the winter there. In preparation for it, an ice-break was made around the keels of his vessels, great quantities of wood were collected

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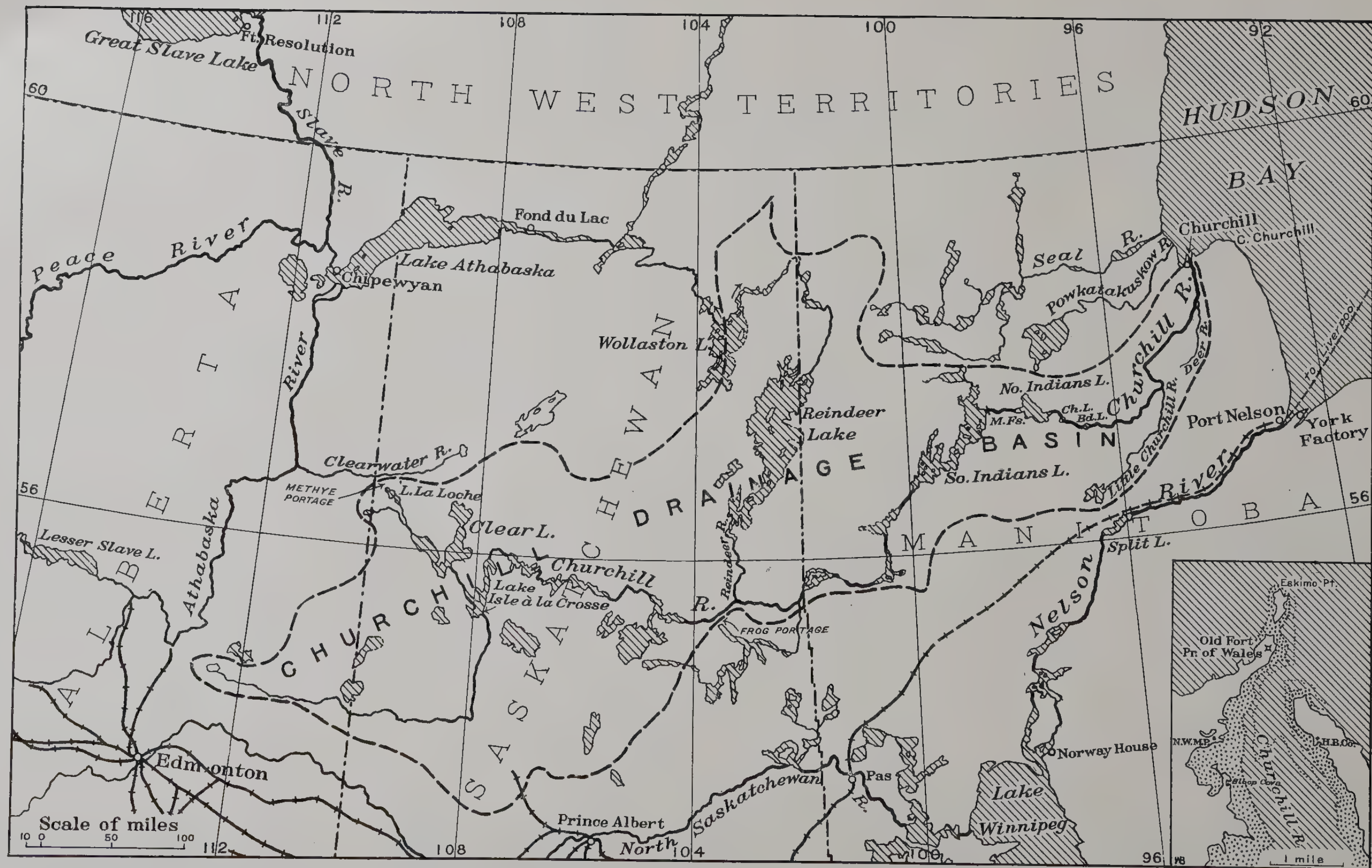

Sketch-map showing the drainage basin of the Churchill River. Scale, 1:8,100,000. Based on the base map of Canada, 1:6,336,000, published by the Department of the Interior, Ottawa. *Abbreviations:* Ch. L., Churchill Lake; Bd. L., Billard Lake; M. Fs., Mission Falls. *Note:* The route of the Hudson Bay railroad between Pas and the lower Nelson River in 95° W. is incorrectly shown. It should parallel the line, as here indicated, on its southeastern side at an average distance of about 25 miles and cross the Nelson River at Manitou Rapids, about 20 miles above Split Lake, and at Kettle Rapids (95° W.).

from the forests which at that time extended to the water's edge, and rough fire-places made of rocks were built on the decks of his two vessels. The winter was a terrible one to the sailors unaccustomed to such a severe climate and to the best methods of protecting themselves against it. Through exposure and scurvy, one after another of the crew perished, until in June only Munck himself and two of his men survived. When the ice finally went out in the spring the three men succeeded in getting the smaller of the two ships, the *Lamprey,* afloat and in it sailed to Denmark. Before leaving, however, Munck bored holes in the hull of the *Unicorn* and sank her with all her freight, with the intention of returning later to rescue her. On reaching Denmark, however, the outbreak of war in Europe demanded Munck's services for his sovereign in another field and he made no more journeys to Hudson Bay.

The *Unicorn,* however, did not remain long undisturbed. On descending the river, Indians discovered it with the bodies and clothing of a race which they had never before seen. While they were plundering the vessel, the gunpowder on board was exploded and ship and Indians alike were destroyed. Some eighty years later a brass cannon with the stamp C4—Christian IV—was dug up from the river flats of Churchill harbor, which proved conclusively that here was the location of Munck's winter quarters. The Cree name for the Churchill River dates from Munck's visit. It is still called by them the "Mistayseebee," or Great-River-of-the-Strangers.

With the establishment of the Hudson's Bay Company in 1670, trading posts were soon built on Hudson Bay, the first five forts being at Albany River, Hayes Island, Ruperts River, Port Nelson, and New Severn. In the year 1686 a Captain Abraham sailed north from Port Nelson and established a post at the mouth of the Churchill River, naming it after the newly appointed governor of the company, Lord Churchill, afterwards first Duke of Marlborough. In 1718 a wooden fort was built on the river about five miles from its mouth on the site of the trading-post occupied at present by the company. This fort, to which was given the name Fort Prince of Wales, did not remain long in use, however. In 1694 a French fleet under the command of the noted admiral Iberville had sailed into Hudson Bay and captured Port Nelson. When the territory was restored to the English in 1713 by the Treaty of Utrecht, a strong sentiment arose in favor of strengthening all the company's forts. This finally culminated in the building of a new stone Fort Prince of Wales on Eskimo Point at the mouth of the Churchill River to serve as a protection for the company's best harbor.

The new fort was begun in 1736 and finished in 1771. It was designed by military engineers who had served under Marlborough, and at the time of its completion was the strongest fort in North America, its walls surpassing in strength even those of Quebec. According to the original plans its walls were to have been 42 feet thick, but owing to the objection of the governor they were first built with a thickness of but 25 feet. It was after-

FIG. 2—Churchill River: A chute 13 miles below Churchill Lake. (Figs. 2 to 11 inclusive are from photos of the Geological Survey of Canada.)

FIG. 3—Chipewyan Indians and their tepees at Fond du Lac on Lake Athabaska.

wards found, however, that the walls had a tendency to sink when heavy guns were fired on them, so one section was pulled down and rebuilt according to the original specifications. The armament consisted of forty guns varying from six to twenty-four pounders. It was from this fort that Samuel Hearne started on his famous overland journeys in 1769-1770, in the course of which he discovered the Coppermine River and Great Slave Lake. These expeditions were most important from the fact that they were the first attempt on the part of the Hudson's Bay Company to explore the country inland. Hitherto they had never ventured away from the coast at Churchill, depending on the Indians to come to them to trade. Hearne's work marks the beginning of a new era for the company and for the country.

Hearne's name is also associated with that of Fort Prince of Wales in connection with the most striking event of its history. As a reward for his services in carrying his explorations to the Coppermine River, Hearne was appointed governor of the fort, but his rule was destined to be but brief. One afternoon in August, 1772, a French fleet under the command of Admiral de la Pérouse appeared before the fort; its intentions were unsuspected by Hearne, who was totally unaware that France and England were at war. His surprise, therefore, can be imagined when, early in the following morning, he received a summons to surrender from four hundred French soldiers drawn up in front of the fort. The garrison consisted of but thirty-nine men, a totally insufficient number to withstand a siege, and Hearne promptly capitulated. After endeavoring to demolish the thick walls of the fortress, La Pérouse sailed away, taking Hearne with him as a prisoner. When peace was signed in the following year between England and France Hearne was sent back by the Hudson's Bay Company to take charge again at Churchill. He did not attempt to occupy the fort again, however, but established his residence five miles up from the fort on the site of the original trading-post of the company, where wood and fresh water were more available. The old abandoned fort stands today in practically the same condition in which the French left it. Another interesting reminder of Hearne may also still be seen today at Churchill. On the smoothly glaciated rock surface of what is known as Sloop Cove, so called from the fact that two of the company's vessels, the *Furnace* and the *Discovery*, spent the winter of 1741-1742 there, may be found carved the names of a number of men, some in letters seven feet in length. Among them is the following: "Sl. Hearne, July Ye 1, 1767," undoubtedly carved by himself with chisel and hammer.

Of the early exploration of the Churchill River very little is known. The old map of the portion of the river from its mouth up to Isle à la Crosse is supposed to have been made by Peter Fidler, an early pioneer trader and explorer, who acted as a surveyor for the Hudson's Bay Company. It is thought that Fidler spent the winter of 1808-1809 at Fort Churchill and in the summer of 1809 made his track survey of the river. It is also highly

probable that the years 1809-1811 were spent by him in continuing his surveys on the Powkatakuskow and Seal Rivers to the north in the effort to find some easier route than the Churchill to the upper portion of the river and to the Athabaska region, but evidently no such route was discovered.

It is unfortunate that we do not know more about the life and work of this explorer. In many respects he was a most interesting and remarkable character.[1] He was a man of good physique, a hard worker and an equally hard drinker, a great reader and student, but of an irritable disposition, with little consideration for others. He himself tells of passing, while on one of his long canoe trips, a fellow surveyor, David Thompson, without either stopping or speaking, and from what is known of Thompson's character it is highly probable that the lack of friendliness shown on this chance meeting in the wilderness was due to Fidler. His will is a further illustration of the eccentric character of the man. After bequeathing a number of legacies, he directed the balance of his estate to be placed in the public funds and to be allowed to accumulate until August 16, 1969, the two-hundredth anniversary of his birth; the heir of his youngest son, Peter Fidler, was then to receive the accumulated amount.

After the union of the North-West Company with the Hudson's Bay Company in 1821, which followed a long period of rivalry for the trade of the interior, the lower part of the Churchill River was completely abandoned as a trading route. In its place the Saskatchewan River, which had long been used by the North-West Company, now became the important route to the upper Churchill country and the Athabaska region. Since that time the lower Churchill has been descended but a very few times. The Chipewyan Indians who trade at Fort Churchill travel overland, making most of their journeys with dogs in winter. The river is also avoided by the Cree Indians of Split Lake on the Nelson River, who occasionally make trips to Fort Churchill over a portage route leading to the Little Churchill River. The latter is followed to its junction with the main Churchill; three miles below where they unite the latter is left and a portage route followed to the Deer River, a much smaller stream flowing parallel to the Churchill and entering it about twenty-two miles above its mouth. This route is a difficult one to follow, especially in midsummer, when the water of the Deer is so low that almost continuous portaging is necessary. In spite of this fact, however, the Indians invariably use it rather than descend the "Great River of the Strangers," of which they stand in great dread. In 1915 the writer received many warnings from well-meaning Indians at Split Lake as to what would befall if an attempt should be made to go down the main river, but as will be shown later it proved to be an excellent stream to descend.

The country drained by the Churchill River is typical of the physiographic province to which the name Laurentian Plateau is applied, a region

[1] J. B. Tyrrell: Peter Fidler, Trader and Surveyor, 1769 to 1822, *Proc. and Trans. Royal Soc. of Canada*, 3rd Series, Vol. 7, 1913, Section 2, pp. 117-127.

FIG. 4.

FIG. 5.

FIG. 4—A gorge on the Churchill River.

FIG. 5—Typical rapids on the Churchill River.

FIG. 6.

FIG. 7.

FIG. 6—Barren Ground topography near Fort Churchill.

FIG. 7—Hudson's Bay Company post at Split Lake, Nelson River.

of pre-Cambrian rocks, mainly granites and gneisses, covering an area of over a million square miles in the form of a letter V surrounding Hudson Bay. Its most striking feature is the remarkable regularity over so great an area. There are no high elevations; the general level of the interstream areas is seldom more than 200 feet above the level of the streams; those that do rise even but slightly above this height stand out as prominent hills. The surface is very uneven and hummocky, consisting of hollows and ridges, the former usually occupied by lakes or muskeg and the latter frequently having precipitous sides. Residual soil is almost entirely lacking. The drainage is highly disorganized. Lakes are numerous; streams expand and contract along their course, and rapids and falls are characteristic features. In many places the run-off is undefined by channels and spills over rock cliffs.

Modern Exploration, and Description of the River

The upper portions of the Churchill River have been mapped by T. Fawcett, J. B. Tyrrell, and Wm. McInnes; a full description of these parts is given in the reports of the last two.[2] The portion of the river from its headwaters at Lake La Loche to Frog Portage, near which the Churchill is joined from the north by the Reindeer River, was surveyed by Mr. Fawcett in 1888. It had first been ascended by some fur-traders from Montreal who afterwards combined to form the North-West Company and was regularly used as a trading route for many years to the Athabaska and Mackenzie River country. It contains numerous lakes separated by stretches of swift water containing falls and rapids, one of which, Snake Rapids, is over 1½ miles in length. The two largest lakes on this portion of the river are Clear Lake and Lake Isle à la Crosse, each over 35 miles in length. The chief disadvantage of this as a route to the Athabaska River is the famous Methye Portage, 12¼ miles in length, from Lake La Loche to the Clearwater River. The route was finally abandoned when, with the building of a railroad to Edmonton and a road from there to the Athabaska River, it was demonstrated that scows could safely be run down the latter to Lake Athabaska.

The next portion of the river as far as the outlet of Southern Indians Lake has been mapped by Mr. McInnes. Here again the river consists of a chain of lake expansions separated by stretches of swift water, in which numerous portages are necessary. The largest lake in this portion and indeed along the entire course of the river is Southern Indians Lake. It is 92 miles long and has a width of 15 miles at its broadest part. It contains many islands, and its shore-line is very irregular. On the early maps prepared from the track surveys of Peter Fidler the bays were united to form a lake with something corresponding to the true outline but showing an area much

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[2] J. B. Tyrrell and D. B. Dowling: Report on the Country between Athabaska Lake and Churchill River, *Ann. Rept. Geol. Survey of Canada*, Vol. 8 for 1895, Report D, 1896.

William McInnes: The Basins of the Nelson and Churchill Rivers, *Geol. Survey of Canada Memoir No. 30*, 1913.

greater than it actually possesses. In fact the lake nowhere shows any great expanse of water.

The remainder of the river from Southern Indians Lake to Hudson Bay was the portion mapped during the summer of 1915. Access to the river was obtained from Split Lake on the Nelson River, over the portage route to the Little Churchill. From the mouth of the latter, the main Churchill was ascended to Southern Indians Lake. At only one or two places in this distance was any indication found that the river had formerly been used as a canoe route. A Hudson Bay axe-head at one place, an old cabin on Billard Lake, and some cuttings near Southern Indians Lake were the only signs of man which were discovered. For the numerous rapids and falls on this portion of the river there were, with but one exception, no signs whatever of any portage trails. The river in this distance is marked by three lake expansions, Northern Indians, Churchill, and Billard Lakes, several long, wide stretches of smooth water, and elsewhere by narrow swift reaches. In the latter are included four narrow chutes where the river contracts to a width of from 100 to 200 feet and plunges down between rock walls, five falls varying from 8 to 20 feet in vertical drop, numerous rapids necessitating portages, and stretches of swift water where pole and tracking line were continually in use.

Thirty miles below the mouth of the Little Churchill the granite-gneiss of the region disappears under a covering of horizontal Trenton limestone through which the river has cut its course. At places for a distance of 27 miles the river is bordered on either side by vertical and overhanging walls 60 feet in height. The current here is swift, but no rapids are encountered which cannot easily be run. It is probably this portion of the river which has given it such a bad reputation among the natives of the region. In the spring and early summer ice-jams undoubtedly occur in this part of the river and make it a dangerous portion to venture upon, but when descended late in August only a few patches of ice remained on the limestone cliffs. For late summer the Churchill is therefore much to be preferred to the Deer River route for a canoe journey to Fort Churchill.

The last stretch of the river flows in a northerly direction, and an interesting feature to observe is the change in vegetation as one proceeds from the wooded belt into the Barren Ground region; the trees become gradually smaller and fewer in number until at Churchill itself trees are practically absent.

In the last 20 miles the river is wide and shallow and contains many islands. The highest point affected by the tide is 12 miles above its mouth. Below this point the estuary has a width of 3 miles, bordered on either side by a ridge of quartzite. The Hudson's Bay Company post of Churchill and the Anglican mission are situated 5 miles from the mouth of the river on an old beach along the north shore of the estuary. Near the mouth of the river not far from old Fort Prince of Wales is situated the barracks of the North

FIG. 8.

FIG. 9.

FIG. 8—Port Nelson, September, 1915. When the railroad now under construction is completed, Port Nelson will become an important outlet for the shipment of wheat from western Canada to Europe via Hudson Bay.

FIG. 9—Hudson's Bay Company post of Fort Churchill.

FIG. 10

FIG. 11.

FIG. 10—Eskimos at their summer camp near Fort Prince of Wales.
FIG. 11—Chipewyan girls at Fond du Lac, Lake Athabaska.

West Mounted Police, while directly opposite is the large warehouse of the company. On the extremity of Eskimo Point at the mouth of the river still stands Fort Prince of Wales, with its dismantled parapets and guns.

Inhabitants of the Region

The inhabitants of the region consist of a few wandering Indians and a small number of Eskimos living on the coast. The Indians belong to two separate tribes, the Crees and the Chipewyans, and in a general way the Churchill River forms a boundary between their territories, the Crees living to the south and the Chipewyans to the north. All those who come to trade at Split Lake are Crees, those that come to Fort Churchill are all Chipewyans.

The Chipewyans belong to the great Déné stock, a name given to a group of tribes with linguistic similarities who occupy all the interior country west of Hudson Bay from the Athabaska River north to the region occupied by the Eskimos, and across the Rocky Mountains almost to the Pacific Ocean. A further idea of the wide distribution of this stock may be gained from the fact that the Navajos of Arizona, the Apaches of the plains, and the Hupas of California belong to the same branch. The Canadian tribes included among the Dénés are nine in number, of which the more important are the Chipewyans, the Dogribs, living between Great Slave Lake and Great Bear Lake, and the Yellow-knives, living northeast of Great Slave Lake.

The main region occupied by the Chipewyans is north of Lake Athabaska, and many more come to the trading posts of Fond du Lac and Chipewyan on that lake than to Fort Churchill. The writer has spent two seasons in the region north of Lake Athabaska and found it rather interesting to compare the habits of those at Churchill with those in the more typical region and to note the effect of environment on their mode of living. North of Lake Athabaska travel is by canoe over the numerous lakes and small streams. Three times a year the natives assemble at the trading posts, at Christmas, when they come in for religious service at the mission, again at Easter, and in June for treaty. The latter is an important occasion for the Indians. Every year the government pays each man, woman, and child five dollars in consideration for having taken over the country from them. The Indians never fail to assemble; and while they remain, the trading posts, with all the additional tepees, the great numbers of dogs, and the excitement of dancing and gambling, present a much more animated appearance than under ordinary conditions. The Indians remain until their treaty money is spent and the provisions which they have purchased with it are used up, and then they set out again in their canoes for their hunting and fishing grounds. The birch-bark canoe is still the type most in use, although many of the Indians now have wooden Peterborough canoes, purchased from the traders. The old-fashioned birch-bark possesses the advantage of extreme lightness, an important

consideration on journeys where long portages are an everyday occurrence. The type of dwelling used is the round tepee with its fire in the center. Instead of skins, however, canvas purchased from the stores is now generally used. Along their routes of travel skeleton tepees made of poles are a common sight; these can quickly be converted into a permanent camp by throwing the canvas around them. The diet of the Indians is almost entirely fish and meat. When they leave for their hunting trips they take with them a little flour and tea, but the former is soon consumed. Tobacco and ammunition are considered much more valuable cargo where bulk and weight must be kept at a minimum and where the women and even the small children are smokers. Ready-made clothing is now used almost altogether, but the universal footwear used among them is still the moccasin.

The Chipewyans who come to Fort Churchill number about one hundred and seventy. They remain all summer at the port fishing and hunting. Very few of them own canoes, since their method of travel, unlike that of the Indians of Lake Athabaska, is overland rather than along the streams; otherwise their customs and manner of living are much the same. In the fall, usually late in September, they all start for their hunting grounds with packs on their backs and their dogs loaded with as much as they can carry. Some of them travel as far as Reindeer and Shethnanei Lakes. Generally about three weeks before Christmas the men return to Fort Churchill by dog-team to trade their furs, leaving their families at their camps, and as a rule one or more trips are made again during the winter. Those who have seen them in their winter quarters say that when the caribou are plentiful they live in comparative comfort and are much at their best. In the spring they return to spend the summer at the fort. Their movements and manner of living are always dependent on the food supply.

During the summer some fifty or sixty Eskimos are always camped at Churchill. They live at the mouth of the river on Eskimo Point near old Fort Prince of Wales. In winter they go north to Chesterfield to hunt the seal and walrus.

Fauna

Of the animals of the Churchill River region the most important from the point of view of food is the Barren Ground caribou; large herds come south in winter as far as Northern and Southern Indians Lakes and as a rule they come close to Fort Churchill. Farther north on the Dubaunt River herds numbering many thousand animals were encountered by Tyrrell in July. Moose range as far north as the Churchill River. In 1915 one was seen at the extreme north end of Northern Indians Lake. In the same season quite a number of fur-bearing animals were also seen. Many wolves were observed along the river; some sixteen were counted during the summer. Ten black bears were also seen, besides two black foxes, several red

and cross foxes, and a number of mink and otter. Of other animals may be mentioned beaver, squirrels, chipmunks, and rabbits. Numerous geese were killed on the lakes and along the river. The large gray goose was particularly abundant. Of ducks the varieties noticed include golden-eyes, sawbills, mallards, and black ducks. Plover are fairly abundant and are eagerly hunted at Fort Churchill. Of fish, pike, goldeyes, doré, whitefish. and suckers are common in the lake expansions. One of the most important industries at Fort Churchill is fishing with huge nets for white whales, cetaceans averaging about 15 feet in length, which are quite abundant near the mouth of the river. Their blubber furnishes the supply of food for the dogs.

Vegetation

The trees of the region are all small. Black spruce is much the most abundant, but it rarely grows to a diameter exceeding eight inches. Tamarack and low juniper occur sparingly. Of the deciduous trees much the most common is poplar, of which two species, the aspen and the balsam, are found. White birch occurs sparsely, and both red and gray willow occur locally in dense thickets. Fort Churchill itself is on the edge of the Barren Grounds. The ridges of rock on either side are entirely bare except for a growth of moss and a few small trees in the depressions. The supply of wood is always a big problem at the post, and every year it is necessary to go farther for it.

Economic Conditions and Outlook

Fort Churchill has but little communication with the outside world. Once a year the steamer *Nascopie* arrives from eastern Canada, bringing in the annual supply of provisions. Its arrival is the event of the year, and the writer was fortunate enough to be present for this event after descending the river. In summer the only other way of reaching Fort Churchill is by the river route from Split Lake. In winter, however, the post may be reached by dog-team either overland from Split Lake or along the coast from Port Nelson. Two winter mails are obtained by the latter route from York Factory and Port Nelson.

There is little hope of the country's having any important future. Agriculture can never be important, and the timber is too small for a lumber industry. From the character of the geology of the region, little can also be hoped for in the way of minerals in the immediate vicinity of the river. The fur trade will probably continue to be the chief asset of the region. Should the new Canadian government railway, now under construction to Port Nelson on Hudson Bay, ever prove to be a valuable outlet to Europe for the grain of western Canada, it is entirely probable that the excellent natural harbor of Churchill will sometime be taken advantage of.

THE EARLY RELATIONS BETWEEN NEWFOUNDLAND AND THE CHANNEL ISLANDS

By H. W. LE MESSURIER, C.M.G.

In the English Channel, contiguous to the French coast, is a group of islands and rocks now known collectively as the Channel Islands, but in olden days as the Norman Isles.[1] The principal ones are Jersey, Guernsey, Alderney, and Sark. These islands are the only portion now remaining to England of that territory which formerly was known as the Dukedom of Normandy. The King of England is still held by the Channel Islanders to be Duke of Normandy.[2] The ancient history of these islands is most interesting, dating back to long before the Roman occupation of Gaul and the subsequent conquest of Albion.[3] The largest island of the group is reminiscent of the Roman invasion of Britain by Claudius in 43 A. D., for at that time it was named Caesarea, which has been corrupted into Jersey, and several places in the island are still known by immemorial tradition as "Le Fort de César," "La Petite Césarie," etc. Near the manor of Dielament one sees the remains of an ancient work, in the known form of a Roman camp.[4]

Although an appanage of the British Crown the people of these islands retain the old Norman laws; and the officials, with the exception of the Lieutenant Governor, bear the old Norman designations, and the laws are administered as in Norman days. The inhabitants retain many of the ancient customs, and nowhere in France will you hear more antique Norman spoken than in Jersey and Guernsey. One of the ancient usages still survives. When Rollo was Duke of Normandy, in order that peace and justice might be maintained in his duchy, his subjects were given the privilege that during his life, and after his death, whenever any of them were wronged or injured in their possessions they could obtain immediate aid by crying *Ha! Ro, Ha! Ro, à l'aide, mon prince, on me fait tort.* This cry may still occasionally be heard in the Channel Islands, and heed has to be paid to it according to the ancient laws.[5]

In former days and up to the nineteenth century, the people of these islands were great sea rovers. Many of them were engaged in the fisheries, and some traded to the Mediterranean and in the course of time followed the adventurous Portuguese down the coast of Africa and returned laden with spoil. As early as 1246 it is recorded that ships of Jersey and Guernsey

[1] Rev. Philip Falle: An Account of the Island of Jersey, Jersey, 1837, p. 278.
[2] *Ibid.*, p. 15.
[3] John Patriarche Ahier: L'Histoire de Jersey, Jersey, 1852.
[4] *Ibid.*, p. 71.
[5] Chron. de Normand, Chap. XXVI, Paris, 1711.

were engaged in the fisheries at Iceland, their catch being brought home and disposed of to the English and the French.[6]

It is an old tradition that fishing vessels belonging to Jersey, on their way to Iceland to engage in the summer fisheries, when nearing their destination were overtaken by a northeast gale which drove them southwest for some days until finally they fell in with a land whose waters teemed with codfish. They loaded their vessels there and then returned to Jersey. It was shortly after this that Cabot made his voyage of discovery in 1497, and it was always maintained by the old Jersey settlers in Newfoundland that Cabot learned from Jersey fishermen who visited Bristol of the western land that they had discovered. Be that as it may, it is a certain fact that the Channel Island fishermen were among the first, if not the first, fishermen to visit Newfoundland. It has been asserted by Jerseymen that a ship belonging to Du Moulin visited the harbor of St. John's in 1500, and at Bras D'Or and Blanc Sablon in Labrador fishing establishments belonging to Channel Islanders were in operation very early in the sixteenth century.

Rut, in the account of his voyage to the New-found-isle, relates that "on the third day of August, 1527, entered into a harbour called St. John's, and there we found eleven sail of Normands, one Breton and two Portugal barks, all a-fishing."[7] The Normands were no doubt the fishing people of the Norman isles, now known as the Channel Islands.

In the old Jersey records it is mentioned that in 1591 John Guillaume was fined by the Royal Court for selling in France the fish which he had brought from Newfoundland. They also inform us that by the end of the seventeenth century the Newfoundland-Jersey trade, which had brought a large amount of prosperity to Jersey, had declined, owing to the fact that Colbert, the prime minister of Louis XIV, had put a high duty on fish imported into France in foreign vessels. The trade revived, however, about 1730, and the period from that date to the French Revolution was a very prosperous one for Jersey and Newfoundland commerce. In 1731 there were seventeen vessels from Jersey engaged in Newfoundland trade; in 1732 there were twenty-four; in 1771 there were forty-five; and in 1785 there were fifty-nine vessels. Besides these Jersey vessels there were a number of Guernsey vessels engaged in the same trade.[8]

Harrisse, in his history,[9] notes that in May, 1591, the fishermen of Guernsey, through one Colin, applied to the municipality of St. Malo for permission to fish in Newfoundland, but were refused. This refers to that portion of the coast of Newfoundland which came under the jurisdiction of the French in 1662 by the secret arrangement made between Charles II and the French king, whereby all the southern coast of the island west of Cape St. Mary's was to be held by the French. The Guernsey and Jersey people

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[6] Jersey Chronicles in archives of Jersey.
[7] Purchas His Pilgrimes, 1625.
[8] Falle: *op. cit.*, and Jonathan Duncan: The History of Guernsey, London, 1841.
[9] Henry Harrisse: John Cabot, the Discoverer of North America, and Sebastian, His Son. London, 1896.

had, prior to 1662, fished in Placentia and Fortune Bays, and the Villeneuves had a fishing establishment at Placentia before the French occupation. Jersey Side in Placentia Bay is the only reminder left of the fact that a fishing firm from the Channel Islands once occupied this spot.

FIG. 1.

History, as it deals with the discovery of America, gives us records of certain expeditions which sailed from the Old World to search for and discover lands in the west. Each expedition was fitted out at the expense of one of the crowned heads of the maritime states of Europe, and their doings were fairly chronicled, but no account was taken of the venturesome fisherman or trader who sailed away in pursuit of the wealth of the seas and the accumulation of riches by trading with the barbarians or savages of

little known lands. Yet there is often a record left in the names of places which tells us of the people who first discovered the harbors, capes, rivers, etc., of a new country, although it may not be chronicled in history. As Canon Taylor says,[10] "the name of a district or of a town may speak to us of events which written history has failed to commemorate." That many of the names of places in Newfoundland were given by the people of the Channel Islands proves that it was very early known to, and occupied by, these adventurous fishermen.

It has in recent years been asserted by two writers[11] on Newfoundland that John Cabot discovered and named St. John's, the capital of Newfoundland, on St. John's day, 1497, the date on which he first saw the land of America. On an examination of the account of John Cabot's voyage I fail to find any authority for this assertion. It has also been contended by these writers that Cape Bonavista was the landfall of Cabot, and Judge Prowse, the author of the "History of Newfoundland," vigorously maintained that this was the case and relied very strongly on tradition.[12] Messrs. Harrisse,[13] Dawson,[14] Biggar,[15] and others, however, do not agree with Judge Prowse and argue that Cape Breton was the land first seen by Cabot. In his article on John Cabot in the Encyclopædia Britannica,[16] as well as in his "Voyages of the Cabots,"[17] H. P. Biggar speaks of the landfall of Cabot as some place on the American continent, and not Newfoundland. If Newfoundland was not the landfall of Cabot, he could not have discovered and named St. John's on St. John's day, 1497.

But supposing that Cape Bonavista was the landfall of Cabot, we have it on record that he made the land, with a large island lying off it. There is no large island lying off Cape Bonavista nor off St. John's. Cabot had been at sea for fifty-seven days in a caravel of fifty tons, and it is certain that when he made the land he would at once seek anchorage to obtain wood and water and proceed to clean his ship. In those days, when anti-fouling paints were unknown, vessels' bottoms had frequently to be cleaned during a long voyage. Moreover we are told that Cabot did land and that after he landed "the Royal Banner was unfurled and in solemn form Cabot took possession of the Country in the name of King Henry VII. . . . Having taken on board wood and water, preparations were made to return home as quickly as possible, and he sailed North three hundred miles."

St. John's lies eighty miles south of Cape Bonavista; if Cabot had

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[10] Isaac Taylor, Canon of York: Names and Places, Rivington, London, 1864, 1865, 1873.

[11] The late D. W. Prowse and the late Archbishop Howley in Newfoundland newspapers and magazines.

[12] D. W. Prowse: A History of Newfoundland from the English, Colonial, and Foreign Records. London, 1895.

[13] Henry Harrisse: work cited in footnote 9.

[14] S. E. Dawson: The Voyages of the Cabots in 1497 and 1498, *Trans. Royal Soc. of Canada: Section II*, Vol. 12, 1894, pp. 51-112.

[15] H. P. Biggar: The Voyages of the Cabots and of the Corte-Reals to North America and Greenland *Revue Hispanique*, Vol. 10, 1903, pp. 485-593.

[16] 11th edit., 1910-11.

[17] See footnote 15.

landed at Cape Bonavista and sailed north he could not have made St. John's; if he had sailed south instead of north he could not have reached St. John's on St. John's day. St. John's was not named on any of the early charts; it first appears in a chart by Desliens[18], 1541, and the name was first recorded by Rut. Who then gave that name to the place? And why should Rut in 1527 speak of it as though it had been known and so called for some time? I have no doubt that the name, like many names around the coast of Newfoundland, was given by some of the rovers of the Channel Islands, most likely by a Jerseyman from the parish of St. John's in Jersey.

On the northeast coast of the island of Jersey there are three places lying near each other and in the order named, viz:—St. John's Bay, Petit Port, and Bouley Bay. Can it be mere coincidence that in Newfoundland we have St. John's Bay, wherein the harbor of St. John's is situated, Petty Harbour, and Bay Bulls (formerly written Boulee Bay and so appearing on the old charts), all contiguous and following in the same order as the Jersey places? I submit that this evidence is strong enough to warrant the opinion of Channel Islanders that a Jerseyman named these three places St. John's, Petty Harbour, and Boulee Bay.

Jersey is divided into twelve parishes, viz:—St. Owen's, St. Peter's, St. Brelade's, St. Lawrence's, St. Mary's, St. John's, St. Hillier's, Trinity, St. Martin's, St. Saviour's, Grouville, and St. Clement's. Many of these names are prominent in Newfoundland, especially in the names of bays and inhabited places, such as St. Mary's, St. Mary's Bay, St. Lawrence, St. John's, St. John's Bay, Trinity, and Trinity Bay. It may be said that these names were universally used by French, Spanish, and Portuguese discoverers in naming the new places that they found, but I am strongly of opinion that surrounding circumstances and early occupation by Channel Islanders prove that the names originated with them.

On the northeast coast of Newfoundland the majority of places have French names. It is difficult to say whether the French are responsible for any of them, but many are undoubtedly Channel Island names. Brehat Bay, on the eastern shore of the long, narrow peninsula in the north, is one, and no doubt reminded a Channel Island fisherman of the place where he moored his fishing vessel during the months of winter. In the islands of Jersey and Guernsey in those days there were no safe winter harbors or mooring places, and Brehat on the Norman coast, southwest of Guernsey, was used almost exclusively by the Channel Islanders as a wintering port for their vessels. Farther along we find Conche and Croque, two ports near together. Croque is the name of a place and of a point on the northwest coast of Guernsey, and La Conchee lies just off the point. Gouffre is a name to be found both in Jersey and Guernsey, as Le Gouffre. The harbor now known as Hilliers was originally called St. Heliers, the name of

[18] Nicholas Desliens of Dieppe.

the principal town in Jersey. Blanc Pignon is also of Jersey origin, as is Cormorant; as no such bird as a cormorant was ever found in Newfoundland, this island is probably named after a similar island rock lying off the coast of Jersey.

Turning now to the southeastern extremity of the island, we find in Conception Bay many places the names of which are evidently of Channel Island origin. The names Harbour Grace and Carbonear do not appear on any maps prior to 1700, and some of the old names such as Frillon and Cape L'Argent have disappeared. Carbonear is a corruption of Charbonier, which was the name given to it by the Jerseymen, as they had charcoal pits there at a very early period. A letter written by an old Jersey lady early in the eighteenth century speaks of "Charbonier," referring to Carbonear. This letter was written to a gentleman living at Harbour Grace and was in the possession of his family until quite recently. At Mosquito Cove near Carbonear there was a Jersey establishment very early in the history of Newfoundland.

These fishing establishments were called "rooms,"[19] and it is quite usual in this country to speak of them as "Jersey rooms," no matter whether the proprietors belonged to Jersey or Guernsey. Harbour Grace is no doubt an Anglicization of Havre de Grace and was not named by the French, as they never resorted to Conception Bay either for fishing or for settlement, but it is a well-known fact that at a very early period two Jersey firms had fishing establishments there. The ground on which the Post Office stands and the land adjacent belonged to the Gushue family from time immemorial and was known as the "Jersey room." Gushue is a corruption of Guizot, the name of a well-known Jersey family. As a proof that the Gushues were originally Guizots they can show a piece of plate with the name Guizot on it, which has been handed down for generations. Near the waterside of this property was a large rock in which an iron ringbolt was fastened, used in mooring ships, and on it were cut names and letters in old Jersey style. The De Quettevilles had an establishment on the south side of Harbour Grace, also known as the "Jersey room," very early in the sixteenth century. The house in this property was called the Stone House and was built of freestone quarried at an island in the bay. Only the foundations now remain. Peter Le Seour, who was a convert to Methodism by Coughlan and who afterwards introduced Methodism into Jersey in 1770, carried on a business at Harbour Grace.

Bay Roberts was originally Bay de Roberts; the Roberts were a Jersey family. A prominent hill in this place is still called Prelaux Hill, after two Jerseymen who lived there. Near the southeast point of Conception

[19] A fishing "room" consisted of owner's or agent's house; shop and store; warehouses for storing fish; cookroom (a building in which the shoremen, that is the laboring men working on shore at the curing and shipping of fish, lived); cooperage; forge; sail and net lofts; stages, or places in which the fish was landed, split, and placed in salt; flakes (erections on which the fish was spread to be dried after being in salt for a certain time); etc.

Bay lies the little fishing village of Bauline; there can be no doubt that the original name was Baleine, after a place in the island of Sark which it very much resembles. The names of many of the inhabitants of Conception Bay are reminiscent of the Channel Islands. Gushue (Guizot), Puddister (Poingdistre), Pasher (Perchard), Hookey (Le Huquet), Le Grow (Le Gros), Fillier (Filleul), Hawcoe (Hacquoil), Nichol (Nicolle), Piccott (Picot), Furey (Le Huray), Norman, Noel, Le Drew, Gosselin, Grouchey (Gruchy), Murrin (Mourant), Cernew (Quenault) are names peculiar to Jersey and Guernsey and prove the descent of these people, although many of them have no knowledge of where their forefathers came from. It cannot be argued that they are of French descent, as no French ever settled in Conception Bay or resorted there for fishing, and the people who bear these old Norman names have been settled there for generations.

On the south coast of Newfoundland there are many more Channel Island names among the inhabitants. St. Mary's Bay, Cape St. Mary's, St. Mary's Harbour, and Colinet are names peculiar to Jersey. The Nicolles of Jersey, early in the history of Newfoundland, had a fishing establishment at St. Mary's Harbour. St. Mary's was probably named by them after the parish of St. Mary's in Jersey, and the bay in which the harbor was situated and the cape at its western entrance took their names from that of the principal harbor.

At the eastern entrance to this bay there are two places now called St. Shotts and St. Shores which formerly were named St. Jacques and St. George. The French pronunciation of these two names is responsible for the corruption. These two points might have been named by the French, but it is not likely that they would have called a place after the patron saint of England, whereas the Channel Islanders would. In Placentia Bay, at Placentia, the old French capital, the Villeneuves of Jersey had a fishing establishment long before the French occupation, as previously noted in this article. From there they moved to Burin and established a business which was continued uninterruptedly by Jersey firms until a few years ago. Marquise, between Placentia and Argentia, is probably named from La Marquise in Guernsey. On the west side of Placentia Bay, we have Paradise from Paradis on the Guernsey coast, Petit Fort from the same source. Jersey Island lies outside of Rushoon and Bain Harbour. Croney Island off Beau Bois is Gros Nez. In Burin, at the entrance to the cove where the Jersey premises are situated, lies an island known to past generations as Villeneuve Island after the Jersey family which removed from Placentia about 1680. Corbin Island and Harbour a few miles southwest of Burin bear a well-known Jersey and Guernsey name. At Little St. Lawrence the Jersey firm of De Grouchy, Nicholle & Co. had a thriving establishment. A drawing of the island on which the principal buildings were established appears in the diary of the Duke of Clarence (afterwards William IV), who visited this place in H. M. S. *Pegasus* in 1786. St. Law-

rence was probably named after the parish of St. Lawrence in Jersey. Lying off the eastern point of Fortune Bay is Jerseyman's Bank, and twenty-five miles inside the point is Fortune, evidently named by a Jerseyman after Fortunée in Jersey. Farther in the bay is Harbour Mille (pronounced Millay). In Jersey there is a place called Millais and several families of that name. There is a place called Corbin on the west side of the bay which is both a Guernsey and Jersey name. Blue Pignon is evidently Blanc Pignon, after the place of that name in Jersey. Miller's Passage is a name which is evidently a corruption, as no person of the name of Miller ever lived in the neighborhood or was known to have been there. Jersey Harbour was the nearest inhabited place in the early days, and it is probable that Mouilliérs, after the Jersey name, was the original designation. To show how names have been corrupted, that of a place near Miller's Passage is now known as Mose Ambrose; the original name was Mon Jambe. Jersey Harbour was named by Jerseymen. Pass Island was originally Passee Island, whether called after Passee in Guernsey or *passe,* meaning a channel, it is hard to determine; the old French charts give Passee, which does not mean a channel. In French *passe* means pass, channel; *passé,* beyond; *passée,* a passage of troops. The name of Pass Island was written Passee without any accent marks. We now come to Hermitage and Hermitage Bay. When this place was named there were no people in Newfoundland excepting the aboriginal Indians. There is only one way of accounting for the name, and that is that it was called so by a Jerseyman who saw in an island off Hermitage a resemblance to the Hermitage in Jersey off the port of St. Helier.

There can be no doubt that the people of the Channel Islands early settled along the south coast of Newfoundland, the family names of these people occurring frequently from St. John's to Cape Ray. Messervy, Clement, Payn, Tessier, Le Messurier, Grandy (Grandin), Lesbirel, Dumaresque, Le Feuvre, Hulon (Huelin), Ayre (Ahier), St. Croix, Cabot, De la Cour, Le Grand, Renouf, Berteau, Du Tot, Le Marquand, Le Drew, Bonnell, Knights, Hue, Lambert, Sacrey, Bisson, Beaucamp, Chevalier, Vautier, Le Moine, Le Fresne, Corbin, Le Roux, Carey, Le Scelleur, Sorsoliel, Frewing, Angot, Pinel, Ereant, La Fosse, Le Quesne, Falle, Le Riche, Vaudin, La Rasignoll, La Blanc, Tupper, Havilland (Du Havilland), Fashon (Fashion), Dobree, Thomey (Thoume), Ozanne, Tibbo (Thibault), and Siviour are among the names peculiar to Guernsey and Jersey which designate many of the inhabitants in the settlements of Placentia, Fortune, and Hermitage Bay and along the coast to Cape Ray. In Hermitage Bay is a place called Gaultois. The original name was an old Norman word, Galtas, which means "like a pinnacle or dormer"; the place itself has several pinnacles and is well named. There has been much controversy about the name Ramea given to a number of islands which lie southwest of Burgeo; it has been written in various ways, Ramie, Ramée, and Ramea.

Le Ramée is the name of a place in Guernsey, *rames* is an old Norman word for wild vetches, and vetches are to be found in all these islands. In all probability the name Rames was given to them because of the quantity of vetches found there. At Rencontre, east of the Ramea Islands, there are two hills, at the mouth of a small bay, which are called St. Aubin and St. Helier after two towns in Jersey.

On the western coast of Newfoundland, Bay St. George was probably named after the parish in Guernsey of that name, and the island of Guernsey at the entrance to Bay of Islands was named by a Guernsey Islander.

In the foregoing I have endeavored to show the intimate connection which the people of the Channel Islands have had with the early history of Newfoundland. So far as I know this subject has not been dealt with by historians; in fact, our local authorities Pedley,[20] Harvey[21] and Prowse[22] in their histories completely ignored the Jersey and Guernsey men, although in their time the remembrance of some of the old Jersey "rooms" was quite fresh, and some of the Jersey firms were then in existence. The De Quettevilles, Clements, Renoufs, Le Messuriers, Payns, Falles, Berteaus, De Grouchy, Nicolls, Villeneuves, all had at one time establishments, the places of which are as well known today as they were one hundred years ago.

Before concluding I wish to note that the Jersey people had an early connection also with the continent of America.[23] The state of New Jersey, in the United States, was a portion of that tract of country lying between the Connecticut River and the eastern side of Delaware Bay as well as all the islands between Cape Cod and the Hudson River, which Charles II had bestowed upon his brother James on the 12th of March, 1664. To this tract the name of Nova Caesarea,[24] or New Jersey, was given, in honor of Sir George Cartaret of Jersey, who governed the isle from 1643 to 1651 and there entertained Prince Charles during his exile from England. The Duke of York subsequently transferred to Lord Berkeley and Sir George Cartaret of Jersey all his new possessions.

Another curious fact, which marks the early connection that the Channel Islanders had with America and their knowledge of the intercourse with the Indians, is that while the French word for tobacco is *tabac,* the Channel Islanders cálled it *ptun,* the name of a very old Indian tribe of America which, until very lately, was supposed to be extinct. This word is still in use in the Channel Islands.

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[20] Rev. Charles Pedley: The History of Newfoundland from the Earliest Times to the Year 1860. London, 1863.

[21] Joseph Hatton and Rev. M. Harvey: Newfoundland, the Oldest British Colony: Its History, Its Present Condition, and Its Prospects for the Future. London, 1883.

[22] Work cited in footnote 12.

[23] Article "New Jersey," Encyclopædia Britannica, 11th edit., 1910-11.

[24] Caesarea was the name given to the Island of Jersey by the Romans. Jersey is a corruption of Caesarea. See Falle's history (cited in footnote 1), p. 2.

OUR IMMIGRANT PROBLEM: A DISCUSSION AND REVIEW

By ELLSWORTH HUNTINGTON

During this strange period when war checks the stream of new citizens who usually swarm into the United States, we are thinking of immigration in a new light. On the one hand, we hear the insistent call of manufacturers for more laborers and of housekeepers for cheaper servants. On the other, the voice of the laborer is heard rejoicing because his wages are increasing and his standard of living is rising. Such conditions, however, are no more than the foam on a wave of temporary prosperity. They neither prove that immigration is desirable nor that it is undesirable. If we would discover the best immigration policy we must shut our ears to the deafening clamor of the immediate present and must listen to the record of what has actually happened in the past and see what it promises for the future when viewed in the light of science.

Three recent books[1] present an interesting epitome of the problem of race and immigration as it confronts the United States today. All three consciously or unconsciously emphasize racial traits. Although utterly different in method and purpose they agree in showing that our attitude not only toward the new immigrant but toward the people of diverse races already in our midst must ultimately be decided on the basis of expert judgment as to the respective parts played by heredity and environment. We have tried to make good citizens by means of religion, education, good government, sanitation, and philanthropy, not to mention other things. We have been sure that opportunity was all that is needed to make useful citizens out of almost any race. Of late, however, the students of eugenics have made us realize as never before that the main body of a stream can never be higher or purer than its source. If our immigrants are dull of mind and weak of will, our citizens will possess the same qualities. It is also beginning to dawn upon us that human energy is one of the main foundations of human character and that energy depends upon physical environment even more than upon social environment and training. Evidently the problem of immigration can never be solved until we add to our present efforts a full knowledge both of the part played by inheritance and of the degree to which inherited traits can be modified by physical environment. For the present, however, let us confine ourselves to heredity, since that is the phase of the problem which demands the most immediate and

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[1] C. V. Roman: American Civilization and the Negro: The Afro-American in Relation to National Progress. F A. Davis Co., Philadelphia, 1916.

Samuel Joseph: Jewish Immigration to the United States from 1881 to 1910. *Columbia Univ. Stud. in Hist., Econ., and Public Law*, Vol. 59, No. 4, 1914.

E. A. Ross: The Old World in the New: The Significance of Past and Present Immigration to the American People. Century Co., New York, 1914.

drastic action. Let us see to what conclusions we are led by a study of the three books under review.

The first book is ''American Civilization and the Negro,'' by Doctor Roman. It deals with the first great immigration to America by people who are not largely Anglo-Teutonic in race. Perhaps we should not call the negroes immigrants, for their ancestors came to this country almost as early as those of any of us, but at any rate they still differ from the rest of us so much that they present a problem like that of more recent arrivals. In attempting to discuss Doctor Roman's book I find myself considerably embarrassed because the thing that interested me most in reading it was race psychology as represented by the author and reviewer. Perhaps the best way to give the reader a fair idea is frankly to relate my own experience. After reading forty or fifty pages I turned back to the title page and pondered on it. The book was interesting, and I sympathized deeply with its general purpose. Nevertheless, I was puzzled that an ex-President and Editor of the National Medical Association should drag in so many big words by the heels, only to explain them in footnotes, or in an ample glossary at the end. I was surprised by the abundant italics and innumerable quotations. The quotations were admirable in themselves, but I could not help feeling that they were overdone. It seemed almost as if the author had sorted his notes into groups and found a place for everything. This method and the author's strong tendency to digress and to philosophize aroused in my mind a certain impatience, which was intensified by the author's habit of setting up men of straw and battering them unmercifully. ''Why fight with the windmills?'' I asked. ''No one denies that the white man's ancestors were savages, that many modern white men are beasts, or that millions of good negroes are far superior to millions of bad white people.'' Yet in spite of the impatience aroused by the method and style of this book every thoughtful person must feel strongly that Doctor Roman is fundamentally right in his plea that colored people should be judged as individuals and not as a race. We judge white men that way. Why not be equally fair to colored people?

After reading seventy pages with thoughts like these I suddenly discovered what I doubtless should have realized before, namely, that the National Medical Association is not the American Medical Association but a colored organization. My attitude changed at once. Instead of the impatience which had inclined me to drop the book or else to write a stinging review, I felt strong sympathy for the author's brave attempt to obtain for his race that justice which we white men still deny. The minor matters which had aroused my critical instincts no longer seemed important. My own change of heart on discovering that Doctor Roman was a negro was at first most disconcerting. It made me realize that although I am glad to meet a negro on the same terms as a white man of similar character and although I have great confidence in the future growth and achievements

of the colored race I am nevertheless racially biased. In spite of myself I judge the negro by a standard different from that which I apply to white men. The difference is that the standard is far more lenient for the colored race than for the white. A book which I should score severely if written by one of the leading white physicians of the country I am inclined to praise when written by a leading colored physician.

If Doctor Roman is right, this attitude is a grave injustice to the negro. The keynote of his book is that white men and colored men are alike. The white man may be ahead of the colored, but the difference is in degree, not in kind. Doctor Roman's own book suggests something of quite a different sort. Of course there are negroes who can write books like those of the white man. Yet there remains the subtle fact that even the best friends of the negro do not expect from him the same sort of work as from a white man. No matter how well he has been educated or how fully he has identified himself with white civilization we expect that even the scientific colored man will differ from the scientific white man much as an artist differs from an engineer. Each is superior in certain respects, but they are emphatically not alike. In a book about bridges by an artist we applaud things which we should frown upon if stated as the conclusions of an engineer. In other words, taking the colored race as a whole we expect—and I believe that the negro himself expects—that his work will be tinctured with an element of emotion which we do not look for in other races.

Doctor Roman's book is an emotional appeal, humorous, eloquent, and pathetic by turns, but it is never a scientific argument. He quotes the old saying that there are three kinds of lies—"lies, damned lies, and statistics." He avoids all three, but has a special abhorrence for the last. Therefore he is inconclusive. Yet he clearly sees the fundamental issues in the race problem. These may be summed up in two questions, biological and geographical. (1) Biologically, are there permanent racial differences which cannot be eradicated either by environment or by education and culture? Doctor Roman answers "No." (2) Geographically, does a race change its innate characteristics under the influence of a new geographical environment? Doctor Roman believes that in the new environment of the southern United States the Anglo-Teutonic white man on the one hand and the African negro on the other, even when they remain racially pure, are tending away from their ancestors toward an intermediate type resembling the American Indian. His own medical practice among colored people in Tennessee convinces him of a tendency away from the diseases that have been regarded as especially characteristic of the negro and toward those characteristic of the white man.

The Jew and the negro are strangely alike and strangely different. They are alike because both races have been subjected to the most cruel injustice and oppression. It is probably safe to say that during the century preced-

ing the emancipation of the slaves in America the Russian Jew suffered as much oppression as the negro. If we include the northern negroes there probably was scarcely more illiteracy among the colored people than among the Jews. During the half century since the emancipation of the negroes, however, their opportunities have been greater than those of the Russian Jews. The differences between the two races are much more marked than the resemblances. One race has come here to escape oppression, the other was brought to endure oppression; one is a race acutely proud of its supposed biological differences from other races and eager to emphasize them, while the other tries to appear as like the European races as possible. The Jew herds in cities, while the negro works on the farm; the Jew takes pride in assertiveness, while the negro may well take pride in his power to make merry in spite of hardships.

Because of this strong racial contrast it is interesting to compare Doctor Joseph's book on "Jewish Immigration to the United States" with Doctor Roman's book. Each is a book by a member of a highly specialized race in which he attempts to show what his race has done and how it is related to American civilization. Each is the kind of book that one would expect from an able member of the respective races.

Doctor Joseph's book is crammed with statistics and facts. It contains scarcely a statement that the most ardent critic would question, and everything is treated with absolute logic. It is the book of a member of a race which is sure of itself and its achievements and which feels no need of appealing to the rest of mankind when once it is given the chance which America affords. Nevertheless, one does not read this book with the interest that one has in Doctor Roman's work. There is nothing to cause a smile, to arouse an emotion, or to stimulate new investigation. The book first takes up the recent history of Russia, Rumania, and Austria in relation to the Jews. It shows how recent progress has aroused the non-Jewish population to the point where they have begun to be competitors with the Jews as skilled artisans and merchants. This has combined with fanaticism to cause anti-Jewish activities which have been relatively mild in Austria, but have taken the form of extremely repressive laws in the two other countries, and even of *pogroms* in Russia. The severity of the anti-Semitic activity is closely reflected in the number of Jews who come to America. Under persecution not only does the number of Jewish immigrants greatly increase, but the proportion of women and children increases still more. This proportion is at all times larger than among other races, which shows that the Jews come here to settle permanently. Abundant statistics in the text and long tables at the end of the book show the exact condition of the Jewish immigrants, their occupations, and their destination. The proportion of "skilled" laborers is larger than in any other important group of immigrants. A third of all who come are tailors, who usually settle in New York.

Doctor Joseph's book brings the Jews to us, as it were, but it offers no light on the serious question of whether the Jews are going to become part and parcel of the American people, or whether they are going to remain aloof and thus constitute a problem.

After reading the books of Doctor Roman and Doctor Joseph one cannot but wonder how extensively we are still introducing into our country elements which in spite of the new environment will retain their old characteristics as tenaciously as do the negroes and the Jews. Professor Ross in his interesting book on "The Old World in the New" attempts to answer this question. In the character of his book and in his racial inheritance, which is Anglo-Scotch-Irish-American, he stands between the two other authors. His book deals freely with statistics, but it also strengthens its hold on the reader by humor and emotion. It arouses opposition, as may be judged from the fact that both Doctor Roman and Doctor Joseph question some of its statements, but it is also highly suggestive and leads the reader to think and investigate for himself. It is so interesting that it should be widely read. One by one it takes up the different immigrant races and briefly and cleverly characterizes each. It lays strong emphasis upon the value of heredity and points out that the descendants of the early Puritans, Huguenots, Scotch-Irish, Quakers, and others who came with high purposes have done far more than their share in contributing the people who today by ideals and by power of concentration are leading the country. The way in which the more recent immigrant types are described may be illustrated by the Irishman. Statistics show that he is more apt than others to become a pauper, but to offset this he stands close to the top in the virtues of morality and family loyalty. His sins are apt to be those of kindliness. That is why he is a political boss. He really wants to help "the boys," and when one of them once gets a job he cannot bear to turn him out. In a large factory this quality of friendliness is apt to make him the superintendent or foreman, while the German is much more likely to be the scientific expert, and the American of the older stock the financial head and the determiner of policy. The Scandinavians are pictured as in some ways the antithesis of the Irish. After Bridget has worked in the family five years and goes away to set up a home of her own, she comes around occasionally to ask after the "childther," but Frieda takes the money that she has carefully saved, and is never heard of again.

In this pleasant vein Professor Ross gives a picture of one race after another. One feels that the pictures are perhaps too impressionistic, but they are certainly suggestive. The author feels keenly the deterioration in the type of immigrants who are coming to us. The immigrants of today come from less competent classes than those of a generation ago. Doctor Joseph also brings this out, although he shows that it is less true of the Jews than of most races. Professor Ross believes that no greater danger besets our country than our present plan of practically unrestricted

immigration. We apply a few tests for health, but for the infinitely more important matter of mental and moral fitness we apply no tests whatever.

The three books here reviewed epitomize our immigrant problem. They show that it is utter folly to attempt to determine upon an immigration policy without the most careful study of the laws of heredity. It answers no purpose to say that we do not believe in heredity; it merely shows lack of familiarity with scientific investigations. As Doctor Davenport has well said we all believe in heredity. We prove it every time that we buy a packet of seeds marked *double* petunia, *scarlet* sweet peas, or *yellow* bantam corn. The fact that we buy these seeds proves that we have such confidence in heredity that we know that the special characteristics named outside the package will appear months later in our gardens. Few, if any, biologists deny that man is subject to the same laws of heredity as are animals, and that the mind is as much influenced by inheritance as is the body.

In spite of the agreement of biologists as to the reality and importance of mental as well as physical differences among the races of men, we are scarcely able as yet to define exactly what qualities belong to each race. Hence it is doubtful whether we show wisdom in excluding some races and admitting others. We are thereby doing the very thing that Doctor Roman justly arraigns us for. We are accepting the idea that certain races are inferior to, or at least are so inherently different from ourselves that it is better that they should not live among us, but we are overlooking the fact that the differences between individuals of the same race are enormously greater than those between races. Our immigration laws are as inadequate as if we believed that a family of stupid peasants from eastern Europe may in a few years develop into people of the caliber of the settlers at Plymouth. Can our country stand the strain of such an immigration policy? Do we know whither it is leading us? As yet we have scarcely begun to collect and analyze the vast body of statistics that are needed for an intelligent understanding of the biological and geographical questions involved in immigration. If the books here reviewed prove anything, they prove that our first step should be a stringent and effective regulation of immigration so that for ten or twenty years we may be sure that we are admitting none except those whose inherent capacities make them fit to share our citizenship. Such a policy would at least keep us out of danger. It would give an opportunity for some well-equipped and permanent agency to begin a far-reaching study of the mental and moral characteristics with which various types of immigrants are permanently endowed by heredity and of the changes which occur in immigrants under a new environment.

GEOGRAPHICAL RECORD

AMERICAN GEOGRAPHICAL SOCIETY

Monthly Meeting of November. The regular monthly meeting of the American Geographical Society was held on Tuesday, November 21, at the Engineering Societies' Building, 29 West Thirty-ninth Street. President Greenough presided. The President congratulated the Society on the highly satisfactory response which had been received to the invitations to Fellowship in the Society extended to a selected list of people throughout the country instead of, as heretofore, chiefly to residents of New York and vicinity.

He thereupon submitted for confirmation the names of 1,118 candidates, each of whom had been approved by the Council, and they were confirmed by the meeting as Fellows of the Society.

The lecture for the evening was entitled "Exploration in the Upper Amazonian Valley," by Harriet Chalmers Adams, F.R.G.S. Mrs. Adams gave a highly entertaining description, illustrated by exceptionally good lantern slides, of the eastern slopes of the Peruvian Andes and the adjacent plains, together with an account of experiences among the forest tribes of the region.

NORTH AMERICA

Conservation of Bird Life in North America. Since the commencement of reservation work by the National Association of Audubon Societies in 1902 the conservation of bird life has made great advancement in the United States. Its status was discussed by Dr. T. Gilbert Pearson in an address before the seventh annual meeting of the Conservation Commission of Canada (*Report of the Seventh Annual Meeting*, Montreal, 1916). Reservations now number about seventy. They are scattered over the country from the gull and tern refuges of the Maine coast to the egret asylums of Florida. Along the great migratory route of the Mississippi is a long line of them —the valley from St. Paul to Memphis, the sunken lands of Arkansas, and the swamps of Louisiana. But they also extend farther afield. In the Yukon delta is a reservation larger than the state of Connecticut. Another takes in the western group of Hawaiian Islands; it was raided by Japanese feather-hunters in 1915. The Pribilof Islands shelter birds as well as seals, and the latest and one of the most notable additions to the list is the Canal Zone, an important winter station for migratory birds from the United States. The society is carrying out a vigorous propaganda in Alaska, a region gaining in interest from the conservation point of view as Canada is pushing forward its northwestern frontier of civilization. Yet the Dominion, with vast stretches of land unfit for agriculture, has unusual opportunities for conservation. Of the regions particularly calling for the establishment of reservations is Labrador, where the decimation of bird life lamented by Audubon three-quarters of a century ago is still progressing.

Joint action between the Dominion and the United States will undoubtedly contribute to the progress of bird conservation on the continent as a whole, and it is satisfactory to note that the bird migration treaty pending between the two countries promises to be ratified before long.

The Correct Name of Lassen Peak. The recent eruptions of Lassen Peak (see in part R. S. Holway: Preliminary Report on the Recent Volcanic Activity of Lassen Peak, *Bull. Amer. Geogr. Soc.*, Vol. 46, 1914, pp. 740-755, reprinted from *Univ. of California Publs. in Geogr.*), have brought this most active and interesting volcano of the United States into the public eye. The newspaper despatches frequently refer to it as "Mount Lassen," evidently in conformity with the names of other well-known peaks, such as Mount Shasta and Mount Rainier. The form "Lassen Peak" is, however, the one that has been in general use by scientific writers from the time of the Geological Survey of California under Professor J. D. Whitney in 1865 to the standard "Geomorphic Map of California and Nevada" published by the Earthquake Investigation Commission in 1908 (for comment, see *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, pp. 233-234). This usage was given official sanction by a decision of the U. S. Geographic Board on October 9, 1915. The same form occurs in the titles of two reserves previously created with the peak as a nucleus, the Lassen Peak National Forest and the Lassen Peak National Monument. The most recent creation, Lassen Volcanic National Park, omits the generic noun.

The peak and the adjoining county in California are named after Peter Lassen, a sturdy pioneer who guided many an early settler into the Sacramento Valley. A small crumbling monument thirty miles from the peak marks his last resting place. "In the early days of the Pacific Railroad surveys some pious monk called the peak St. Joseph's mountain, but the names Lassen's Peak and Lassen's Butte soon came into general use. Whitney has shown the inappropriateness of the French term *butte*, which, translated exactly, means knoll. As Lassen never owned the mountain, in later years the possessive form of the name was dropped," thus establishing the present form (*U. S. Geol. Survey Press Bull. No. 294*).

In this connection it may not be amiss to recall that Lassen Peak lies in the Cascade Range and not in the Sierra Nevada. Many general works of reference extend the Sierra Nevada northward to the Klamath River, to include Mount Shasta. This, however, is an arbitrary boundary. The dividing line between the volcano-topped Cascades and the tilted and complex fault-block, made up chiefly of ancient rocks, which constitutes the Sierra Nevada lies along the North Fork of the Feather River, as shown by Diller (*U. S. Geol. Survey 14th Annual Rept.*, Part II, Pl. 40).

Fog and Water Supply in California. A note by W. G. Reed (*Monthly Weather Rev.*, 1916, p. 288) calls attention to the importance of fog in providing moisture for vegetation in the California coast region in summer. The close relation between the occurrence of summer fog and the redwood is well known. Single trees, as on the Berkeley Hills of the Coast Ranges, drip with moisture during summer fogs. Although the ground away from the trees is dry, the grass under the trees is green, and the ground is moist to a considerable depth. R. DeC. Ward.

Revival of Iron Mining in the Adirondacks. The opening of the Champlain branch of the New York State Barge Canal and the reduction of freight charges by over 50 per cent should contribute much towards a revival of the mining industry of the eastern part of the state (Iron Ore Shipments from Lake Champlain, *Bull. Atlantic Waterways Assoc.*, Vol. 8, No. 6, Philadelphia, 1916). Up to 1906 the mines, worked almost continuously for over a century, had yielded a total output estimated at 35,000,000 long tons, of which amount more than a fifth was mined during the decade 1880 to 1890 (*New York State Museum Bull. 119*, Albany, 1908). The latter date marks the beginning of a period of depression accounted for in part by competition with Lake Superior ores. The Champlain deposits, however, are still productive, and the ore is of high grade, so that under improved conditions of transportation and with demand still active the anticipated revival is justified. To meet it Port Henry at the southern end of the lake is to be equipped with new docks of modern type, capable of handling an annual production of ore estimated at 1,500,000 tons.

SOUTH AMERICA

A New Theory of the Origin of the Chilean Nitrate Deposits. The paralysis of the Chilean nitrate industry during the first months of the war, followed by its no less remarkable recovery, has quickened economic interest in the deposits. Naturally enough comes a recrudescence of scientific interest, with another attempt to solve the vexed question of the origin of the deposits (The Genesis of the Chilean Nitrate Deposits, by J. T. Singewald, Jr., and B. L. Miller, *Economic Geology*, Vol. 11, 1916, No. 2). Unlike former theories the new one seeks to solve the problem of the genesis of the deposits through explanation of their localization. The deposits are limited to the western edge of the *pampa*. The prime causal agencies are the extreme aridity of the region and its peculiar hydrographic features. Although, with the single exception of the Loa, no surface stream reaches the sea between the Rio de Camarones (19° S.) and the Rio de Copiapó (27° S.), the underground water-supply is abundant. The water-table, following the trend of the topography but with less accentuated relief, comes very near the surface of the western edge of the *pampa*. In the *salar* of Lagunas, Tarapacá province, it is only three to three and a half feet from the surface—a circumstance which has proved highly advantageous for the production of pure salt (see "A Unique Salt Industry in Chile," by the same authors, listed in the June *Review*, p. 471). The porosity of the soil of the western *pampa* and the abnormal evaporation, combined with the convergence of ground water in depressions at very slight depths below the surface, cause high concentration of the mineral content of the water. In the most favorable places the degree of concentration becomes such that the more efflorescent salts tend to come out of solution and accumulate in the overlying soil. Where both common salt and nitrate have been deposited the latter naturally tends to effloresce round the edges of the depression: the typical *salar* of common salt is bordered by accumulations of

nitrate. To this simple physical process some or all of those invoked by the earlier theories may have contributed. Atmospheric electricity in the High Andes is a possible agency for the production of nitrate from the air. The decomposition of guano, the nitrogenous source in the theory popularly explained by Tower (The Nitrate Fields of Chile, *Popular Science Monthly,* Vol. 83, 1913), is certainly a factor to a greater or lesser extent. The influence of nitrifying bacteria is rather more problematic. In this connection may be noted a report from the Peruvian School of Mines (Nitrate of Potash in Peru, *Commerce Repts.,* No. 110, Washington, 1916) on an occurrence of nitrate on the Peruvian coast between Pacasmayo and Huarmey. The deposit, of small extent, is of scientific rather than economic interest. The nitrate, existing as the potassium salt, is produced by bacteria and is chiefly remarkable for the rapidity of formation. The deposits have long been exploited by the natives as a source of material for the fire-crackers that are an essential adjunct to the Peruvian *fiesta.*

Professor Bingham's Peruvian Expedition of 1915. In the May issue of the *National Geographic Magazine* Professor Hiram Bingham relates some results of the 1915 Peruvian Expedition, whose successful completion has already been announced (*Bull. Amer. Geogr. Soc.,* Vol. 47, 1915, p. 774). The operations of the expedition were conducted in the same general region as before, i. e. in the basins of the Apurimac and Urubamba Rivers between latitudes 13°30′ (latitude of Cuzco) and 12°30′ S.

Within this territory was covered a considerable area of new ground connected more or less directly with Machu Picchu, a further study of which formed one of the major objectives of the expedition. The former importance of this frontier fortress was confirmed by the discovery of several new trails radiating from the city to various parts of the ancient Inca kingdom. Leaving the Urubamba some distance below Ollantaytambo, the headquarters of the 1915 expedition, a route was taken following the crest line of the Cordillera Vilcapampa and passing some of its most notable peaks—beautiful Salcantay (20,565 feet) of the many glaciers, Soray (19,435 feet), and Soiroccocha (18,197 feet), on whose flanks at an elevation of between 15,000 and 16,000 feet is located what Professor Bingham believes to be the loftiest "forest" (woodland) in the world.

After a descent to the Upper Vilcabamba valley the Cordillera was again traversed by a trail leading direct to Machu Picchu. It is perhaps the most interesting of the lost trails, for it connects the Urubamba fortress with Vitcos on the Vilcabamba, the refuge of the last of the Inca kings. Its course is shown on the route map of the expedition, which also contributes important new information on the hydrography of the region. The earlier expeditions had already proved the existing maps of the region to be seriously incorrect. Raimondi's map, for instance, greatly narrows the divide between the two major rivers and attributes certain tributaries of the Urubamba, notably the Pampaconas, to the Apurimac. A party from the expedition force followed the entire course of the San Miguel, a stream heretofore unmapped and known only to the ubiquitous rubber collector. This stream heads a little north of the Vilcabamba and, flowing in a northwesterly direction, unites with the Pampaconas to form the Cosireni, which in its turn enters the Urubamba at the great bend (see the map accompanying "The Cañon of the Urubamba," by Isaiah Bowman, *Bull. Amer. Geogr. Soc.,* Vol. 44, 1912, No. 12). The party also penetrated a considerable distance up the Comberciato, a still larger tributary entering the Urubamba farther down-stream. Here they encountered members of the hunting and fishing tribe of Machigangas, with whose aid the naturalist secured many valuable specimens.

Machu Picchu itself afforded another fine hunting ground for the natural history collections, for it lies in the transition zone between the temperate and cold highlands and the tropical valleys and plains. Moreover the Urubamba valley forms a migratory route for the bird life of the country, and as many as eighty different ornithological species were noted in this single spot.

The botanical collection was also rich, particularly in food plants. Mr. O. F. Cook, the botanist of the expedition, gives some idea of their value in an article "Staircase Farms of the Ancients" following Professor Bingham's narration. He emphasizes the essentially agricultural foundation of Inca civilization, its antiquity and high development. On biological grounds he believes that most of the cultivated land was originally forested. Its removal must have entailed great labor, and, even when removed, the area at an elevation where agriculture was possible must have been small. Hence not only was the land carefully tilled, fertilized, and irrigated, but its extent was increased by a system of terrace cultivation the most remarkable in the world. The Peruvian plateau and its deep valleys embrace a complete range of climates, and vegetation and food resources are correspondingly varied within short distances. Hence it is not surprising that "more plants appear to have been domesticated in the Peruvian region than in any other part of America." Probably the cultivated plants of the ancient Peruvians num-

ber some seventy or eighty species. For descriptive purposes their distribution is best classified primarily into the three altitudinal belts defined by the use of the predominant food plant: cassava or yuca up to 6,000 feet; maize between 6,000 feet and 11,000 feet; and potatoes from 11,000 feet to the limits of cultivation, over 14,000 feet. The dominant plants of the two latter zones are remarkable for the number of varieties they include, a fact confirming the antiquity of cultivation. Practical interest also attaches to them in respect of the possibilities they present for introduction into the United States. Experiments to this end have been carried out and have proved successful. Last year corn from Cuzco planted on the coast of southern California matured seed where varieties from the corn belt states have failed. The wide altitudinal range of the Andean varieties—Titicaca corn grows at an elevation of nearly 13,000 feet—suggests possibilities of extending the limits of corn cultivation in the United States.

The expedition also continued its anthropological studies. Using the Hrdlička method, 153 Quechua Indians, 90 men and 63 women, were measured and the majority of them photographed. Many other new photographs, some of which illustrate Professor Bingham's and Mr. Cook's articles, add to the importance of the former's unique collection.

New Expedition of Dr. Hamilton Rice to the Northwestern Amazon Basin. Dr. Hamilton Rice, well known for his surveys of the headwater rivers in the Amazon-Orinoco divide region, sailed on November 15 from New York on an expedition to the same area. Doctor Rice proceeded on the *Alberta,* a steam yacht chartered for the occasion, and expects to reach Santa Isabel on the Rio Negro. Using this town as a base he intends to push up the various tributaries as far as possible in a launch which has been especially constructed for this purpose. She is forty feet long and draws only two and one-half feet of water. With a fuel capacity of 700 gallons and a maximum horsepower of 100, she has a cruising radius of more than 1,000 miles, assuming a speed of twelve miles an hour. Doctor Rice's specific field of exploration will probably be the region between the Uaupés and the Inirida Rivers within which only the Içana River has been surveyed, by himself in 1912-13 (see map in *Geogr. Journ.,* August, 1914). Doctor Rice is accompanied on the expedition, which is to last about six months, by Dr. William T. Councilman, professor of pathology at Harvard University; by Ernest Howe, lately of the U. S. Geological Survey, as geologist; and by Earl E. Church of the U. S. Coast and Geodetic Survey, as topographer. The *Alberta* is especially screened against insects and is equipped with a wireless outfit.

Japanese Labor for Brazil. During the last decade Japanese immigration has been favored by the government of Brazil, and several measures have been adopted to deflect such a labor current to the rice fields and coffee plantations of São Paulo and adjacent states. The most recent activity reported is an agreement with a Japanese emigration company for the transport of 20,000 Japanese within a period of two years. The emigrants will be farm laborers and will engage in the cultivation of rice, beans, and coffee. A new steamship line to be inaugurated between the two countries will accommodate the emigrant traffic. Its first sailing is announced for February, 1917 (*Commerce Repts.,* Nos. 264, 265, 1916).

New Steamship Service between Argentina and Bolivia. The November issue of the *Boletín de la Unión Panamericana* reports the initiation of a new line of river steamers putting Rosario, Argentina, into direct communication with the Bolivian port of Puerto Suárez, 1,800 miles distant up the Paraguay. Thus ocean-borne freight destined for Bolivia is transshipped only at Rosario, whereas under former conditions change had to be made at Asunción and frequently at other river ports as well.

EUROPE

Italy and the Adriatic. The Italian point of view of the Adriatic question is set forth under this title by Dr. M. I. Newbigin in the October, 1916, issue of the *Scottish Geographical Magazine* (pp. 466-477). The article, which was originally read before the section of geography at the Newcastle meeting of the British Association in September, 1916, thus presents the opposite side of the case from that taken up by Sir Arthur Evans in "The Adriatic Slavs and the Overland Route to Constantinople" (*Geogr. Journ.,* April, 1916). It is an instructive summary of the essential geographical facts affecting the destiny of the Adriatic region. The easterly seaward extension of the alluvial plains of northern Italy and the increasing shallowness of their ports are seriously hampering Italy's economic development. The lack of deep-water harbors is a check to the free and full exploitation of the resources of the plains. Ravenna and Aquileia have lost their former importance, while Venice is beset by natural drawbacks

which make the navigator shun its approaches. As Doctor Newbigin tersely expresses it, "the hiatus between the railway terminus and the harbor at Venice is symbolic for the whole region."

A marked improvement in this condition is observable as soon as the Austrian sections of the Adriatic area are attained. Here, however, a different set of difficulties has to be faced on account of the mountains which isolate the narrow coastland from its natural rearland. Nevertheless, from Trieste southward along the eastern Adriatic to the Albanian frontier there are found harbors that are deep and commodious. Beyond, the question of Valona is of vital importance to Italian interests. The seaport commands the entrance to the Adriatic. Italy, preparing herself to enter the ranks of industrial nations, is taking stock of her assets. In this, Italian leaders have realized that nature has dealt somewhat stingily with their country. Their endeavor to change its political geography is their bid for betterment.

Has Climate "Changed" within Historic Times in Europe? The subject of possible "climatic" changes within historic times continues to attract the attention of many writers. Dr. H. H. Hildebrandsson, the well-known Swedish meteorologist, has recently read a paper on this question before the Royal Society of Sciences of Upsala (translated in *Monthly Weather Rev.*, 1916, pp. 344-352), which is of rather unusual interest, both because of the prominence of the author and because of the clean-cut conclusions which are reached. The "stock" available evidence is taken up, and under each heading the results of Doctor Hildebrandsson's study are briefly stated. The scope of the inquiry is limited to Europe, and the question is not one of oscillations or periodicities but of permanent change.

The non-instrumental evidence is first considered. In Palestine, the culture of the date and of the vine are practiced today as of old. In Italy the laurel and the myrtle and the vine and the fir grow under the same conditions as in the days of Pliny, of Varro, and of Virgil. Hence the conclusion that the climate of Rome is essentially the same now as at the beginning of the Christian era. J. W. Gregory, Partsch, and others have reached the same result regarding conditions in Cyrenaica and Tunisia. The dates of the vintage and the localities and methods of grape culture in France, as determined by a record of ten centuries, indicate that the climate has not changed appreciably. Grapes were cultivated and wine used to be made at isolated localities in Great Britain, and under special conditions, as might be the case today if such industry were profitable. The dates of the opening and closing of lakes and rivers in Sweden and in Russia have been kept, as a complete series, from early in the eighteenth century and in one case from 1530 (with some breaks). The evidence is that spring comes in the Baltic region at the same time, on the average, as it did early in the sixteenth century. The supposed changes in the climate of Iceland, based on botanical evidence and often referred to, have been shown by Professor Th. Thoroddsen, the leading authority on Iceland, to have been the results of economic and political causes. Fossil trees found in the peat bogs are as small as those growing today, and the most ancient Icelandic saga speaks of people going to Norway for wood to be used in building.

A catalogue of severe winters in Danish waters goes back as a complete series to 1750, and as a broken series to the eleventh century. A study of these dates and of other available facts has led Speerschneider and Norlind to the conclusion that there the climate of the Middle Ages was sensibly the same as that of today. In 1582 to 1597, Tycho Brahe kept his famous non-instrumental meteorological journal on the island of Hven. This journal has been studied by Paul la Cour and by Ekholm and compared with modern instrumental records. Paul la Cour found a difference between the wind directions of 1582-1597 and those of today, and Ekholm concluded that the winters were colder then. Hildebrandsson concludes that the winters were colder during that particular period, but that this result does not justify us in assuming that the winters of that century were *as a rule* colder than the present one. Regarding the Alpine glaciers, the well-known views of Heim are quoted.

Doctor Hildebrandsson's conclusion is clearly stated, as follows: "There exist everywhere climatic variations of long and short duration, but it is not possible to prove that the climate of Europe has changed for either better or worse during historic times." The results of Professor J. W. Gregory's recent study of this same subject led him to a very similar conclusion, viz., "in historic times there has been no world-wide change of climate."

R. DeC. Ward.

The Southwesternmost Black Soils of Europe. Writing in the geological series of the *Trabajos del Museo Nacional de Ciencias Naturales* of Madrid (No. 13, 1915), E. Hernández-Pacheco discusses the age and origin of the "black lands" of southernmost Spain. They lie between Cadiz and Gibraltar, in the Janda depression, a tectonic

feature due to a twin system of fractures running at right angles to each other. This bowl-shaped depression has a flat bottom lying at about sea-level and practically lacking an outlet. The shallow lagoon formed in the site during each winter season dwindles away in the summer months, leaving a black residue presenting great resemblance to the well-known *chernoziom* of southern Russia or the *tirz* of western Morocco (see also "Las Tierras Negras de Marruecos," by Juan Dantin, in the same publication).

As far as known, these black soils, whether in Spain or Morocco, were formed under climatic conditions which are no longer prevailing. The black color is attributed to a carbonaceous humus generated during the decomposition of profuse vegetation growing under conditions of excessive humidity. The climate of the period of formation varied probably from temperate to cold, a characteristic of the Quaternary glacial epochs in certain regions of southern Europe. These deposits may be correlated chronologically with the loess of northern Europe and of Asia.

The uppermost layers of this black soil contain abundant relics of the Stone Age industries in the shape of quartzite and flint instruments, some of which undoubtedly belong to the Musterian, while others are probably of the Chellean type. These cultural deposits surround the plain of Janda and give evidence of the upper age limit of the black earth deposits.

The Export of Newfoundland Herrings to France. A relaxation of the "Bait Act" is enabling the export of several thousands of barrels of herrings from Newfoundland to France, where a serious shortage has been experienced in consequence of the war. This step on the part of the Newfoundland government expresses a relation new in the history of the Grand Banks fisheries, notorious for the clashing of French and British interests. The Bait Act was itself an outcome of the opposed interests. It was passed in 1886 to prohibit the sale of bait to the fishers of St. Pierre, who, aided by the high bounty awarded by the French government, could everywhere undersell the Newfoundland cod on the European markets (Round the Empire Notes, *United Empire*, N. S., Vol. 7, 1916, No. 8).

ASIA

Rainfall of China. Mr. Co-Ching Chu, a student in the Graduate School of Harvard University, has constructed a new rainfall map of China, based on data for 44 stations for the period 1900-1911 (*Monthly Weather Rev.*, 1916, pp. 276-281). Where the records do not cover this interval they have been reduced to it by comparison with neighboring stations. Three rainfall districts are noted. First, North China, with mean annual amounts of 20-40 inches (50-100 cms.). More than 60 per cent of the rain falls in the three summer months, with a maximum in July or August and a minimum in February. Second, the Yangtze Valley, with mean annual rainfalls between 40 and 60 inches (100-150 cms.), decreasing very gradually from the coast inland. Winter rains are more abundant than in northern or in southern China, although the amounts are small. July brings the maximum at most stations, and December the minimum. Third, South China, with mean annuals between 60 and 80 inches (150-200 cms.) along the coast, and 40 to 60 inches (100-150 cms.) inland. The percentages of rainfall in summer increase again in this district. June, or sometimes August, brings the maximum monthly rainfall. The control of the rainfall by various types of storms and by wind directions is considered. In northern China the precipitation of winter (December to February) is all in the form of snow; in central China it is partly rain. Snow is rare at Canton and Hongkong. R. DeC. Ward.

Railroads in Siam. Progress in the construction of Siamese railroads foreshadows the establishment of a rapid land route between the Gulf of Bengal and the China Sea. As soon as the Siamese railroads become linked with the systems in China and Indo-China an overland short-cut will become available and the long voyage around Singapore may be avoided.

The first railroad in Siam was opened in 1897 and ran between Bangkok and Ayuthia, the old capital (*Suppl. to Commerce Repts. No. 58a*, Nov. 6, 1916). This, the northern part of the system, has steadily been extended up the valley of the Menam River and beyond, where it now reaches Lampang, on the upper Meping, a western tributary of the Menam. The short distance to Chiengmai, the northern capital, will be completed before long. The region to be tapped here is rich in natural resources. With adequate transportation its products will find a ready market in Bangkok. The southern part of the system embraces the coastal districts of the Gulf of Siam. Of a total of 470 miles, 120 miles were in operation on April 1, 1915. Its most important section will eventually run along the whole length of the Malay Peninsula.

Two Siberian Expeditions. The Sayan expedition, which returned in the early part of the year, has made a study of economic conditions in the fur-producing region of the upper Yenisei (*Russian Suppl. of the London Times,* April 29, 1916). The expedition was organized by the Department of Agriculture and conducted by the game specialist and Asiatic explorer D. K. Soloviev. It represents another measure on the part of the Russian government for the protection of an industry seriously threatened with extinction. In particular, apprehension has been felt for the sable trade, reduced of late to one-sixth of its former dimensions. In 1912 a prohibition of the hunt was extended to Siberia for a term originally planned for three years, but the expedition considers necessary a renewal of the law for an equal length of time. The active measures of the expedition embrace the creation of two warrens, the Sayan of about 630,000 desiatims (1,700,000 acres) and the Kazyr-Suk of about 120,000 desiatims (324,000 acres).

Successful results were also obtained by the Yablonovyi expedition despatched by the Academy of Science in the summer of 1914 under the leadership of V. Ch. Dorogostaiski. Explorations were carried out in the central portion of the Yablonovyi Range, a region occupied by Yakuts and Orochones, the latter a Tungusic tribe described by M. A. Czaplicka in her "Aboriginal Siberia." The expedition achieved its main objective in the collection of valuable specimens of the alpine fauna, including the local mountain sheep heretofore unknown in the European museums (*Russian Suppl. of the London Times,* same date).

POLAR REGIONS

Survey of the Newly Discovered Land by Stefansson. The latest advices received from Stefansson direct, a letter published in the *New York Times* of November 15, report that the survey has been begun of the new land discovered in June, 1915, north of Prince Patrick Island, the northwesternmost of the hitherto known islands of the American Arctic Archipelago (*Bull. Amer. Geogr. Soc.,* Oct., 1915, pp. 766-769, with map). The letter was sent from 78° N. and 116° W., a position corresponding to the southern edge of the new land; it is undated, but from internal evidence it seems to have been written about May, 1916. From hills a thousand feet high inland from Cape Murray (evidently the name given to a cape on the southern coast of the new land), Stefansson says that a water sky could be seen trending first north-northeast for 10 miles and then northwest for 30 miles. The presumption is that the coast has a similar trend, although the actual line could not be distinguished because it was low and covered by snow. On the day of writing a support party consisting of Storkersen, Thomsen, Kilian, and Illum was to return. An advance party consisting of Castle, Noice, and Andersen had left Cape Murray the day before, following the coast north. Stefansson himself was to follow in two days with two Eskimos. This in spite of the fact that he had sprained an ankle so badly about a week before that he did not expect to be able to walk for some weeks. At the time of writing he reported that he was riding with his foot strapped to a board and leaving the sled only occasionally to take compass bearings. Although annoying, he did not consider the accident serious. The men and dogs were living mainly on game, which was abundant. In case this source of supply should diminish, he reports having on hand about a thousand pounds of food and two hundred pounds of kerosene.

Stefansson expected to return by July 20 to the northern end of Melville Island, unless the new land proved extensive, in which case he planned to spend the summer there. The *Polar Bear,* which had been wintering in Prince of Wales Strait, between Banks and Victoria Islands, as already reported on his return by Doctor Anderson, the leader of the southern division of the expedition (September *Review,* p. 233), had orders to meet Stefansson and the new-land party at Melville Island in August, to winter there. Storkersen, with three Eskimos' families, was to spend the summer drying meat and skins in Melville Island for food and clothing for the next spring's trips, in case the *Polar Bear* should not reach Melville Island or should be wrecked.

Several other letters recently received from Stefansson give details with regard to the activities of the expedition since August, 1915, the latest date dealt with in the last communication previously received from Stefansson himself. In September, according to a letter dated Banks Island, January 15, 1916 (*New York Times,* Nov. 15), a party was sent out to survey as much as possible of the gap left in the northeastern coast of Victoria Island between Wynniatt's survey of 1851 and Hansen's of 1905. The supporting party returned safely to the *Polar Bear* on November 2, having left Storkersen, who was in charge of the survey, in good health at Hornby Point, almost as far as Wynniatt's farthest, on October 24. Storkersen expected to advance ten days farther

and consequently had not returned on November 16, when Stefansson left for the Cape Kellett base on the southwestern corner of Banks Island.

Another detail is contained in a letter written at Cape Kellett on December 23, 1915, to Dr. H. J. Spinden of the American Museum of Natural History (*New York World*, Nov. 21). It says that an unfortunate falling out occurred with the "blond" Eskimos of Stefansson's previous expedition. The captain of the *Polar Bear*, whom Stefansson had sent to Minto Inlet, where they were, treated them as inferior beings. This they resented. Complications ensued which resulted in their stripping the captain's party of all they had, down to their drinking cups and plates. To make matters worse, the Eskimos contracted influenza and, when last heard from, were on the verge of starvation because illness had prevented hunting. Their troubles they ascribed to the white man's witchcraft. Should death among them occur either from disease or starvation, Stefansson writes, the break will be serious. At the time they professed great friendliness for Stefansson personally, but, even so, the changed circumstances made inadvisable a sojourn with them which Stefansson had planned.

At present the prospects are that Stefansson will not return until the fall of 1917. In a long letter to Rear Admiral Peary, dated Cape Kellett, January 11, 1916 (*New York Times*, Nov. 23), in which he outlined his plans, he says he still adheres to the original purpose of the expedition, the search for land north and west of the known extent of the Arctic Archipelago. He now places himself the limits of 83° N. and 45° W. Only in case no news of him is received by the spring of 1918 should a relief expedition be sent. But in general he urges that no anxiety be felt for him and pleads that more confidence be placed in his ability to take care of himself than was done during his previous silence.

In this connection it is worth noting that a correct map of Stefansson's routes in 1914-15 has appeared with the official account of the expedition (*Report of the Dept. of the Naval Service for the Fiscal Year Ending March 31, 1916*, pp. 71-80, Ottawa, 1916). It does not differ materially from the map published in the *Bulletin of the American Geographical Society* for October, 1915 (p. 767), which was based on the newspaper account of the trip.

Present Condition of the Crocker Land Expedition. The Acting Chairman of the Committee in Charge has sent to the Society the following latest information concerning the Crocker Land Expedition. According to a cablegram received from Copenhagen on November 15, 1916, the steamer *Danmark*, which was chartered by the committee for the relief of Doctor Hovey and the members of the expedition in north Greenland, was observed in Melville Bay on August 20, 1916, bound northward. From this report it would appear that the steamer had made only 150 miles northward in seventeen days, since previous advices reported her as being off Upernivik on August 3, 1916. This report and her failure to arrive either at Sydney or St. John's indicate that the ice conditions are severe and that the vessel has probably been delayed by ice on her southward voyage. It is still possible that the *Danmark* may reach this country before the end of the year, but even should she be caught in the ice and be compelled to winter in the north no anxiety need be felt for the safety of the party, as the vessel is staunch, well equipped, and well provisioned.

The first relief ship, the *George B. Cluett*, left its winter quarters in North Star Bay the latter part of July and arrived at Battle Harbor, Labrador, on September 7, 1916. She brought out a letter from Doctor Hovey, dated July 10, 1916, stating that he was in touch with Mr. Rasmussen, that the members of the Crocker Land Expedition were well, that Mr. MacMillan had returned to Etah on May 6, 1916, from his 1,500-mile sledge journey to the westward, and that all were looking forward to the arrival of the second relief ship, the *Danmark*.

OCEANS

The Drift of Mines at Sea. A year after the siege of Port Arthur a Japanese steamer nearing Honolulu struck a mine which had traveled more than half the distance across the Pacific. This is one of several cases going to prove that dangers to navigation from derelict mines are by no means impossible. In a paper contributed to *La Nature* for May 27, 1916, Professor Alphonse Berget calls attention to future perils from this source. Basing his argument on a study of currents, the eminent oceanographer finds that vessels will run greater risks in the waters of the neutrals of the present war than in those of the belligerents.

The displacement of floating mines from the area in which they have been strewn is caused by currents. A study of conditions in the Atlantic Ocean shows that floating mines will be liable to drift in a northeasterly direction and that they will eventually attain the coasts of Holland, Germany, Denmark, and Norway. Should any of these

floating weapons be caught by the "Irminger Current"—a northeasterly offshoot of the Gulf Stream which sweeps counterclockwise past Iceland and swings around the southern end of Greenland, finally to merge with the Labrador Current—they might reach the east coast of North America.

In the Gulf of Gascony, an easterly branch of the Gulf Stream sweeps southward along the coasts of La Vendée and the *département* of Landes, after which it continues its course along western Spain. According to investigations undertaken in 1901 under the direction of Prince Albert of Monaco, it was found that floating objects deposited in the Gulf of Gascony eventually reached the northwestern shores of Spain and the northern reaches of the Portuguese coast.

In the Baltic the danger will be greatest along the Swedish coast. The twin system of currents peculiar to this sea consists of a stream proceeding from the North Sea along the Jutland coast into the Skagerak. A counter current along the Norwegian coast empties its waters into the North Sea. In the inner stretches of the Baltic the easterly flow of water is represented by a current along the German coast and northward. A southerly stream washes the Swedish shore.

In the Mediterranean the development of currents is comparatively feeble. The most significant in this connection is that which, traversing the mine-strewn Dardanelles, carries the superficial waters of the Black Sea to the Austrian side of the Adriatic.

WORLD AS A WHOLE AND LARGER PARTS

Proposed New Railroads in the Russian Empire. The remarkable progress of Russian railroad building since the outbreak of the war is an indication of the country's awakening to its industrial needs. Under the title of "Russia's War-Time Outlets to the Sea," an account of the first great stride made to promote Russian transportation facilities was given in the February number of the *Review*. Later advices show that the Russians' eagerness to equip their country with a convenient network of tracks has not abated.

One of the projected railroads is the White Sea-Ural-Ob River line. From Archangel, proceeding east-southeast by way of Pinega, the middle reaches of the Mezen River, and the Ukhtinsky district on the upper Ishma (63° N. and 54° W.), the line will cross the Pechora River at Troitzko-Pechorsk, continue across the Urals, and reach the Ob River at its westernmost bend near the Chemashevsky settlement (63° N.). A southward branch will be built along the eastern foot of the Urals to the station Nadezhdinsky Zavód of the Bogoslovsky railway, a northward branch of the trunk line from Petrograd to Siberia, which it joins at Yekaterinburg. The new line, whose total length will be about 1,000 miles, will thus become continuous with the main Russian system. It will open up districts rich in natural resources: the dense forests of the Mezen, Pechora, and Ob basins and the iron ore and mineral fuel of the eastern slope of the Urals. Besides, Siberian exports, chiefly grain, will be provided with a new outlet.

Other schemes to provide Siberia with new railways are noted in the July, 1916, issue of the *Scottish Geographical Magazine,* which reproduces in abstract form an article and its accompanying map from the *London Times Russian Supplement* for May 27, 1916. New lines are proposed to connect the Lena gold district and the Vitimsk mining area with the Trans-Siberian railway. Out of various proposals, the construction of a line between Tulun, a small station 170 miles west of Irkutsk, and Ust-Kut on the Lena has been selected, and it is expected that the completed line will be prolonged to Bodaïbo, northeast of Lake Baikal, although the method of reaching this terminal directly from Irkutsk by way of Kunerma also finds favor. Minerals and timber abound in this region. Another scheme is in consideration to connect the Kuznetsk coalfields, on the upper Tom south of Tomsk, with the main line at Sudjenka. From this coal basin the line might be extended westward with advantage to Barnaul, in the center of a rich agricultural and cattle-raising district.

In the Far East, Manchuria is to be provided with about 650 miles of new railways (*Far Eastern Review,* April, 1916). An agreement was signed on March 27, 1916, between Russia and China for the construction of a railway to connect the Chinese section of the Trans-Siberian railway (known as the Chinese Eastern Railway) at Tsitsikar with the Amur at Aigun. The line will be continued a short distance upstream in order to end opposite Blagovyeshchensk, the present terminus of the Amur Railway, to which reference was made in the June *Review* (under "Siberian Traffic Problems," p. 461). From Mergen, halfway between Tsitsikar and Aigun, a branch will be run to Kharbin. These new lines will widen the range of the colonization set afoot by the construction of the Chinese Eastern Railway. Chinese settlers followed quickly in the wake of this line, and it is expected that the same migration will be continued. The better agricultural

lands lie southeast of Mergen, near the Sungari River and its affluents, the Hulan and Tunkan. Northward, agriculture yields in importance to forestry and mining.

All these activities are not confined to Russia's ante-bellum domain, as may be gathered from a recent decision of the government to extend the Caucasus railroads from Batum to Trebizond. The *Board of Trade Journal* for October 12, 1916, states that the connecting line will be of the ordinary Russian broad-gage type and that it will be constructed close to the Black Sea coast, so as to avoid the ranges forming the background of this body of water. It is expected that this line will be completed by the summer of 1917.

Rainfall Correlation between North and South America. Mr. H. H. Clayton, of the Argentine Meteorological Office, has made a comparison between the rainfall of the United States (long. 80° W.-110° W.), the annual stages of the Paraná River, and the rainfall of Australia (inverted). The correlation appears to be very close and is probably associated with correlations of temperature found by Mossman and Arctowski in the southern hemisphere. The temperature curves of Alice Springs, Australia, and Córdoba, Argentina, are closely similar to the rainfall and Paraná River curves, and the Arequipa, Peru, temperature curve also furnishes some interesting analogies (*Monthly Weather Rev.*, 1916, pp. 200-201). R. DeC. Ward.

PHYSICAL GEOGRAPHY

A New Experiment on the Strength of the Earth's Crust. The construction of a great irrigation reservoir by the government of New South Wales is affording the geophysicist an unusual opportunity for experiment (Some Geophysical Observations at Burrinjuck, by L. A. Cotton, *Journ. and Proc. Royal Soc. of New South Wales*, Vol. 49, Pt. 3, 1915). The reservoir in question, at Burrinjuck on the Murrumbidgee, is to have a height of 236 feet and a water storage capacity of 30,000,000,000 cubic feet. The weight of such a mass of water must exert a strain upon the contiguous crust. It is this effect that is being investigated. Three pendulums, two of them the instruments used by Hecker and Schweydar in their famous experiments on earth-tides, have been installed in shafts in the steep hillsides enclosing the reservoir. At the time of publication they had been recording satisfactorily for the greater part of a year. In addition to earth-tide, earthquake, and fault movements, they have recorded movements of specific interest to the investigators—slow deflections from the vertical apparently related to the action of the water load. The cause of these movements cannot yet be stated. Local isostatic adjustment and resiliency of the crust have been suggested, but a conclusive opinion must rest on further quantitative evidence.

"Sleet." The Weather Bureau has recently carried on a considerable correspondence in an endeavor to ascertain what meanings are associated with the term *sleet*, with a view to the adoption of a suitable "official" definition. The result of this investigation is that the definition adopted in 1897 is adhered to, viz., "Only the precipitation that occurs in the form of frozen or partly frozen rain shall be called sleet." For the icy coating which is formed by the freezing of rain on cold objects near the earth's surface, the term "ice storm" is rejected and the term *glaze* is adopted. This is the equivalent of the English "glazed frost," the French "verglas," and the German "Glatteis" (*Monthly Weather Rev.*, 1916, pp. 281-286). R. DeC. Ward.

GEOGRAPHICAL NEWS

Captain Amundsen's Visit to This Country. Captain Roald Amundsen arrived in New York on November 27 on the *Frederik VIII* from Copenhagen. One of the purposes of his trip is to purchase an aeroplane for his projected North Polar trip. Details as to this expedition and its postponement were published at the time (*Bull. Amer. Geogr. Soc.*, Vol. 45, 1913, p. 618, and Vol. 46, 1914, pp. 532-533). The voyage is to be essentially a repetition of Nansen's drift in the *Fram*, amplified, however, by our increased knowledge of Arctic meteorology and oceanography. The recent newspaper accounts (e. g. *New York Times*, November 28) quote Amundsen as planning to begin his drift from the easternmost attainable point off the coast of Siberia. His original plan was to start from Bering Strait in order that the drift might carry him nearer to the pole than it did Nansen (Die Probleme des Nordpolarbeckens: Aufgaben und Plan einer neuen "Fram"-Expedition, *Internatl. Rev. der gesamten Hydrobiol. und Hydrogr.*, Vol. 1, 1908, pp. 753-771). The point of emergence from the Polar Basin is expected

to be between Greenland and Spitzbergen. Amundsen now hopes to be able to leave Norway in July, 1918. The aeroplane would be used for side excursions from the ship, including one to the pole.

Personal

Dr. J. G. Andersson, formerly chief of the Geological Survey of Sweden, has been appointed by the Chinese government as the head of a geological survey.

Dr. J. Ernest Carman of the University of Cincinnati has been appointed to the chair of geology at the Ohio State University vacant by the death of Professor Charles S. Prosser.

Professor Frederick Ehrenfeld of the University of Pennsylvania conducted a conference on "Factors in the Lowering of the Land Surface" at the Brooklyn Institute of Arts and Sciences on November 18.

Professor E. de Martonne, Visiting French Professor at Columbia University, read a paper on "The Limestone Plateaus of the Causses, Southern France" before the New York Academy of Sciences on November 20.

Sir Ernest Shackleton arrived in New Orleans on November 3 from Colon and departed immediately for San Francisco on his way to rescue the ten members of his expedition marooned on the Ross Sea side of the Antarctic continent. On November 8 he sailed from San Francisco for Wellington, New Zealand, where he and the rescue expedition expected to sail for the Antarctic on the *Aurora*.

Obituary

Professor Maurycy Rudzki, since 1902 director of the Cracow Observatory, has died at the age of 54 years. Professor Rudzki is best known to geographers for his "Physik der Erde," Leipzig, 1911.

GEOGRAPHICAL PUBLICATIONS

(Reviews and Titles of Books, Papers, and Maps)

For key to classification see "Explanatory Note" in the July number, pp. 77-81

NORTH AMERICA

UNITED STATES

South-Central States

FOSTER, J. H. **Forest conditions in Louisiana.** 39 pp.; maps, ills. *Forest Service Bull. 114.* U. S. Dept. of Agric., Washington, 1912.

The geographical divisions of Louisiana are better understood than those of some other states, owing largely to the researches of Dr. E. W. Hilgard in 1869 and 1877 (see his map in Tenth Census reports, Vol. 5, opposite page 111). In the bulletin before us the state is divided into six or seven divisions, corresponding in a general way with Hilgard's, namely: short-leaf pine uplands, long-leaf pine region (including both hills

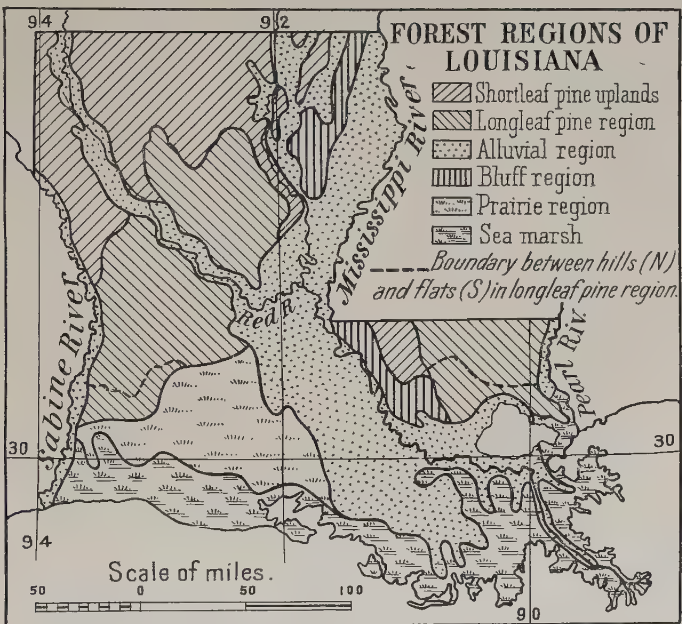

FIG. 1—The forest regions of Louisiana, according to J. H. Foster (*U. S. Forest Service Bull. 114*, 1912.)

and flats), alluvial region, bluff region, prairie region, and sea marshes. The forest conditions are briefly described, about two and a half pages being devoted to each of the timbered regions and a few lines to the last two, which are essentially treeless. Statistics are given of land and timber values, density of forests, amount of timber remaining, etc. There are four excellent half-tones showing different forest types and three small state maps in the text.

From the standpoint of the forester the long-leaf pine and alluvial regions are most important, the former yielding pine timber and naval stores and the latter cypress and hardwoods. Some of the densest long-leaf pine forests in the world are in western Louisiana, and a stand of 45,000 feet per acre of cypress is reported from one of the northeastern parishes.

Only about 20 per cent of the total area is under cultivation at present, and in recent years Louisiana has led all the states in annual cut of long-leaf pine, cypress, and tupelo gum, and all except Washington in aggregate lumber. In 1909, the latest year for which there are reasonably complete figures, the total cut was over 3,500,000,000 feet, of which slightly over three-fourths was pine. Some estimates of the total standing timber in the state were taken, a few months in advance of publication, from a report of the U. S. Bureau of Corporations on the lumber industry of the United States. The total stand is given as 119,800,000,000 feet, of which 56.5 per cent is pine of various species, 13.1 per cent cypress, and 30.4 per cent hardwoods.

The bulletin closes with a discussion of some of the influences that threaten the perpetuity of the forests, such as fire, grazing, lumbering, wind-storms, and taxation, and a summary of recent local legislation on forest problems. As in most other similar works written by northern foresters, fire is treated not so much as a natural phenomenon, whose frequency varies considerably in different regions and has much to do with the normal life-history of the forests, but as a regrettable accident, to be prevented in all forests if possible. It is conceded, however, that it is not a serious menace in the alluvial region. ROLAND M. HARPER.

BAKER, C. L. **Geology and underground waters of the northern Llano Estacado.** v and 225 pp.; maps, diagrs., ills., index. *Bull. Univ. of Texas,* 1915, No. 57. Austin, 1915. [A publication of the Bur. of Econ. Geol. and Technol.]

BURKE, R. T. A., AND A. M. O'NEAL, JR. **Soil survey of Limestone County, Alabama.** 41 pp.; maps. Bur. of Soils, U. S. Dept. of Agric., Washington, D. C., 1916.

CRIDER, A. F. **The coals of Letcher County [Kentucky].** xvi and 234 pp.; maps, diagrs. *Kentucky Geol. Surv. [Repts.],* Ser. 4, Vol. 4, Part 1. Frankfort, 1916.

DUMBLE, E. T. **Problem of the Texas Tertiary sands.** Maps, ills., bibliogr. *Bull. of the Geol. Soc. of America,* Vol. 26, 1915, No. 4, pp. 447-476.

HUMPHREYS, W. J. **The southern Appalachian earthquake of February 21, 1916.** Map. *Monthly Weather Rev.,* Vol. 44, 1916, No. 3, pp. 154-155.

LEE, WALLACE. **Geology of the Kentucky part of the Shawneetown quadrangle.** 73 pp.; map. Kentucky Geol. Surv., Frankfort, 1916. [Including report on deposits of coal, the only mineral of economic importance within the area.]

LEWIS, H. G., AND J. F. STROUD. **Soil survey of Lawrence County, Alabama.** 50 pp.; maps. Bur. of Soils, U. S. Dept. of Agric., Washington, D. C., 1916.

MARKHAM, E. M. **Father of waters [Mississippi River] in flood.** *Engineering News,* Vol. 75, 1916, No. 6, pp. 286-287.

MEYER, A. H., E. S. VANATTA, B. W. TILLMAN, AND R. F. ROGERS. **Soil survey of Webster Parish, Louisiana.** 40 pp.; maps. Bur. of Soils, U. S. Dept. of Agric., Washington, D. C., 1916.

Western States

BOWLBY, H. L. **The Columbia highway in Oregon.** *Amer. Forestry,* No. 271, Vol. 22, 1916, pp. 411-416. [A well-illustrated description of the new highway from Portland to Hood River, 60 miles, which extends across marshlands, valleys, and mountains, through dense forests, and along the brink of a canyon, to the open country east of the Cascades. The route was chosen so as to give splendid views of the scenic features of Oregon.]

—— **Columbia Highway, The new.** Diagr., ills. *World's Work,* Vol. 32, 1916, No. 2, pp. 202-215. [A short description also appears in the *Scientific American* (Vol. 114, No. 25, 1916) under the title "A Beautiful Link in Our Highway System."]

—— **Columbia River highway, The.** Ills. *Scientific American Suppl.,* No. 2113, Vol. 82, 1916, July 1, p. 8.

DAVIS, A. P. **Power possibilities of Federal irrigation projects.** *Engineering News,* Vol. 75, 1916, No. 19, p. 875.

DICE, L. R. **Distribution of the land vertebrates of southeastern Washington.** Map, ills., bibliogr. *Univ. of California Publs. in Zoöl.,* Vol. 16, 1916, No. 17, pp. 293-341. [This area of southeastern Washington (Walla Walla and Columbia Counties) embraces three phytogeographic regions in the sage brush of the Columbia River section, the bunch grass of the prairie to the east, and the coniferous forest of the Blue Mountains. Faunal areas correspond. Description of their characteristics is followed by a consideration of the general zoögeographic position of the entire region and the author's scheme of ecological distribution compared with others.]

Diller, J. S. **The volcanic history of Lassen Peak.** Maps. *Science*, May 26, 1916, pp. 727-733.

Drew, N. L. **Building the world's highest highway.** Ills. *Scientific American*, Vol. 114, 1916, April 8, No. 15, p. 375. [Pikes Peak.]

Flett, J. B. **Features of the flora of Mount Rainier National Park.** 50 pp.; ills., index. Dept. of the Interior, Washington, D. C., 1916. [See comment in the November *Review*, p. 386, on G. F. Allen's "The Forests of Mount Rainier National Park."]

Grover, N. C. **Surface water supply of the United States, 1913. Part 9: Colorado River basin.** 260 pp.; ills., index. *U. S. Geol. Surv. Water-Supply Paper 359.* Washington, 1916.

Grover, N. C. **Surface water supply of the United States, 1912. Part 12: North Pacific drainage basins.** xi and 748 pp.; ills., index. *U. S. Geol. Surv. Water-Supply Paper 332.* Washington, 1916.

Hackett, C. W. **Otermin's attempt to reconquer New Mexico, 1681-1682.** Bibliogr. *Old Santa Fe*, Vol. 3, 1916, No. 9, pp. 44-84; No. 10, pp. 103-132. Santa Fe, N. M.

Hardesty, W. P. **Precise-level survey of the city of Portland, Oregon.** Diagrs., ills. *Engineering News*, Vol. 76, 1916, No. 2, pp. 55-58.

Harris, J. A. **The variable desert.** Diagr., ills. *Scientific Monthly*, Vol. 3, 1916, No. 1, pp. 41-50. ["The striking characteristic of this whole region [the deserts of the Southwest] is heterogeneity, variability, contrast."]

Henry, A. J. **The disappearance of snow in the high Sierra Nevada of California.** *Monthly Weather Rev.*, Vol. 44, 1916, No. 3, pp. 150-153.

Hill, C. L. **Forests of Yosemite, Sequoia, and General Grant National Parks.** 39 pp.; ills. Dept. of the Interior, Washington, 1916. [See comment in the November *Review*, p. 386, on G. F. Allen's "The Forests of Mount Rainier National Park."]

Holway, R. S. **Lassen's second year of rejuvenation.** Ills. *Sierra Club Bull.*, Vol. 10, 1916, No. 1, pp. 92-97. [Carries the record of eruption to October 30, 1915.]

Huntington, Ellsworth. **Death Valley and our future climate.** Ills. *Harper's Mag.*, No. 792, Vol. 132, 1916, May, pp. 919-928. [The strange series of old lake beds in the desert region from Owens to Death Valley preserves records of climatic changes during the past and demands more careful study that impending changes may be predicted. Such a change, for instance, as appears to have occurred in the later thirteenth century would be followed by serious consequences for the country as a whole in view of the economic effects it would produce in the region of "critical" rainfall of the agricultural Middle West.]

EUROPE

General

Grant, Madison. **The Passing of The Great Race, or the racial basis of European history.** xxi and 245 pp.; maps, index, bibliogr. Charles Scribner's Sons, New York, 1916. 9½ x 6.

A geographer of the eighteenth century, Alexander Dalrymple, once remarked "every new undertaking must be dragged up a very steep hill." Mr. Grant's book deals with an old theme in a radically new way but with a literary brilliance and finish that never permits one to realize until the book is closed that the course runs up a very steep hill. Of more importance, he has had the courage to state his conclusions in terms of unmistakable force and clarity. To be sure these desirable qualities are achieved at the expense of much detail that the meticulous reader will miss. Everywhere the direct road is taken to a conclusion that is stated with epigrammatic brevity. It is a book from which the historical and the anthropological writer will quote freely.

The central theme is the Nordic race—its origin, its distribution in late geologic and in historic times, its inherent and stable, in a word, its racial qualities, particularly those which have made it great (Mr. Grant would say "greatest"). These qualities are in part reactions to a former environment, in part the result of contact with neighboring races, in part a spiritual endowment of the race as obscure in its origin as man himself. The author's purpose has been to set forth the facts of race, the reactions of race, race and development, and especially to show both directly and by implication that, in the great panorama of human history, environment on the one hand and language and nationality on the other are agencies with an important but limited field of action.

Those geographers to whom the phrase "geographic control" is a dogma will do

well to read with special care the chapter on Race and Habitat; those to whom the metes and bounds of nationality and language are sacred, the chapter on Race, Language, and Nationality. Geographers will find here and there an approach to the question of environmental influences, but to their regret they will not encounter a discussion of this broad question, though this indeed would require a book to itself. On the other hand the influence of environment is not minimized. It is shown that its effects on primal habits are best illustrated when the race leaves its ancient centers of action and overspreads neighboring lands that present new problems in adjustment, as in the case of the successive human floods that poured over the Afghan passes, or those waves of conquest in which the Nordics left their isolating forests and seas and set their vigor against the feebler qualities of the peoples of the south only in turn to fall a prey to the enervating climate of Mediterranean lands.

In geographic science the book is important because it will stimulate anew the question of the relative parts which heredity and environment play in human development. For the whole interpretation of the world's peoples surely requires attention both to the primal and inheritable qualities of race and to the impact of physical conditions upon the frame and spirit of man, his migrations, and his character. Geographers pay much attention to the latter group of influences but too little to racial traits. It would be a worthy task to have both groups set forth in their relative importance, working from such foundations as this book and others in the same field provide.

Germany

Benkendorff, Rudolf. **Die Isothermen Schleswig-Holsteins und klimatische Messungen auf Föhr.** Inaugural-Dissertation . . . der Universität Kiel. Schmidt & Klaunig, Kiel, 1914. 9 x 6.

The island of Föhr lies off the coast of Schleswig-Holstein. Because of its sheltered location and mild climate it is much frequented by invalids. There is, therefore, considerable interest in its somewhat special local climatic peculiarities. These have been made the subject of investigation by the present author, who, for purposes of comparison, has also studied the temperature conditions of Schleswig-Holstein and has constructed a new set of monthly isothermal charts of this area. In 1869 Professor G. Karsten published a discussion entitled "Die Verteilung der Wärme in den Herzogtümern Schleswig und Holstein," in which were included two isothermal charts, for January and July. In winter and autumn the temperatures are lower over the land than the water; in April to July the temperature increases from west to east, i.e., to leeward, from the water onto the land. The temperature differences are greatest in October, November, December, and June (about 2° C.). February and August show the most uniform distribution. The diurnal ranges of temperature are considerably smaller (averaging 1.5° C. in the mean) on the island of Föhr than over the mainland. Photometric measurements of the relative influence of water and land surfaces upon the intensity of the light, and measurements of the value of the light reflected from different kinds of soil, are included in the report. In view of the hygienic importance which is now known to attach to the character and amount of sunlight and of sky-light, such observations have considerable local interest.

R. DeC. Ward.

Albert, T. J. **Brunswick.** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 6b, pp. 7-9. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

—— **Bodenbenutzung, Die, und der landwirtschaftliche Anbau, 1913.** *Beiträge zur Statistik des Grossherzogtums Hessen*, Vol. 63, 1913, No. 5, pp. 1-68. Grossh. Hessische Zentralstelle für die Landesstatistik, Darmstadt, 1914.

Eager, G. E. **Barmen.** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 6c, pp. 1-2. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

—— **Ernte in Preussen 1913, Die.** *Zeitschr. des Kgl. Preussischen Statistischen Landesamts*, Vol. 54, 1914, pp. xvii-xix.

Fee, W. T. **Bremen.** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 6c, pp. 2-4. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

Gale, W. H. **Munich.** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 6c, pp. 13-16. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

Hammer, Ernst. **Die neuen Normalhöhenpunkte für Preussen.** *Petermanns Mitt.*, Vol. 62, 1916, Jan., p. 21.

Harris, H. W. **Frankfort on the Main.** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 6b, pp. 1-7. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

JEWETT, M. A. **Kehl.** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 6b, pp. 10-15. Bur of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

KEMPER, G. H. **Erfurt.** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 6c, pp. 11-13. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

KLUTE, F. **Büsserschneebeobachtung im Schwarzwald.** Diagr., ills. *Zeitschr. für Gletscherkunde*, Vol. 10, 1916, No. 1, pp. 56-59.

MAGER, F. **Bericht über kulturgeographische Arbeiten im Herzogtum Schleswig.** *Zeitschr. Gesell. für Erdkunde zu Berlin*, 1915, No. 9, pp. 545-558.

—— **Map reading of central Europe, Everybody's aid to the, compiled with special regard to Germany.** iv and 87 pp.; index. William Clowes and Sons, Ltd., London, 1915. 6 x 4.

MEISSNER, OTTO. **Neue Reduktion der Niveaumeterablesungen des hydrostatischen Nivellements auf dem Telegraphenberge bei Potsdam.** Diagrs. *Beiträge zur Geophysik*, Vol. 14, 1915, No. 2, first part, pp. 156-186.

SCHULTE IM HOFE, A. **Die Welterzeugung von Lebensmitteln und Rohstoffen und die Versorgung Deutschlands in der Vergangenheit und Zukunft.** *Beihefte zum Tropenpflanzer*, Vol. 16, 1916, No. 1-2, pp. 1-177.

WOOD, J. Q. **Chemnitz.** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 6c, pp. 4-11. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

RUSSIA

LETHBRIDGE, ALAN. **The new Russia: From the White Sea to the Siberian steppe.** x and 314 pp.; maps, ills., index. E. P. Dutton & Co., New York, [1915]. $5.00. 9 x 6.

There is an atmosphere of realism about Mr. Lethbridge's descriptions of Russia which makes his book at once interesting and worth reading. There are so few accounts of the Russian Empire from the point of view of its external aspect that this straightforward tale of things, places, and people seen fills a great need. The numerous photographs which the author has added to his own description are excellently chosen.

The starting point is Archangel, the port, the life of the inhabitants, and the terrible problem of forest fires in the wooded areas in that region. Next there is a visit to the island monastery of Solovetz (some 200 miles northwest of Archangel in the White Sea), one of the most extraordinary monuments to the monastic pioneer-colonizers of the Russian North. Along the White Sea littoral and back through Archangel to the Northern Dvina lies the route. From here the journey is made almost entirely by water, along the great rivers of northeastern Russia, past cities replete with huge, deserted churches, where the monks have been replaced by merchants, past alabaster cliffs and great virgin forests up into the mining districts of the Urals. Then over the Urals into the fertile farming and dairying country of Western Siberia and by water again down through the land of the Siberian cossacks to the Chinese frontier.

Mr. Lethbridge calls all this "New Russia" because it represents, with its boundless treasures of timber, mineral, and agricultural resources, Russia's economic power of the present and near future. The book is intended to develop the financial and economic interest of the English in the Russian Empire, yet the opportunities it points out should be carefully considered by Americans as well. E. K. REYNOLDS.

BACKLUND, O. **Sur la détermination des différences des longitudes Pulkovo-Paris.** *Bull. de l'Acad. Imp. des Sci.* [*de Pétrograd*], Ser. 6, 1915, No. 4, pp. 273-274. [In Russian; see also entry below under Zemcov.]

BERG, E. **Les maxima extrêmes diurnes des précipitations dans la Russie d'Europe.** Map. *Bull. de l'Acad. Imp. des Sci.* [*de Pétrograd*], Ser. 6, 1914, No. 16, pp. 1217-1234. [In Russian.]

—— **Chemin de fer de Pétrograd à la côte mourmane.** *Rev. Gén. des Sci.*, Vol. 27, 1916, No. 4, p. 104. [This topic was discussed in the Feb. *Review*, pp. 131-132.]

FEDOROV, E. **Sur la note des membres de l'Académie concernant l'étude des forces naturelles productives de la Russie.** *Bull. de l'Acad. Imp. des Sci.* [*de Pétrograd*], Ser. 6, 1915, No. 16, pp. 1679-1680. [In Russian.]

GALITZIN, BORIS. **Sur le tremblement de terre du 18 février 1911.** *Bull. de l'Acad. Imp. des Sci.* [*de Pétrograd*], Ser. 6, 1915, No. 10, pp. 991-998. [In Russian.]

—— **Port of the midnight sun, The.** Map. *The Independent*, Vol. 86, 1916, No. 3520, p. 274. [Catharine Harbor on the ice-free Arctic coast of Russia. See article in the February *Review*, pp. 128-132.]

PURINGTON, C. W. **The pilgrims of the Ural: On the road to Verkotur.** Ill. *London Times Russian Suppl.*, 1916, May 27, No. 20, p. 11.

RAY, J. A. **Odessa.** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 13a, pp. 4-11. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

—— **Russia.** 53 pp. Guaranty Trust Company, New York, 1916. 7 x 5. [Informational pamphlet on Russian industries.]

STEBBING, E. P. **Forests of Russia: Immense reserves of timber.** Ills. *London Times Russian Section*, 1916, July 29, No. 22, p. 7.

VEREŠČAGIN, G. J. **Etudes sur les bassins d'eau douce situés dans les vallées des fleuves du sud-est de la Russie d'Europe.** *Bull. de l'Acad. Imp. des Sci.* [*de Pétrograd*], Ser. 6, 1915, No. 7, p. 588. [Brief note in Russian.]

VERNADSKIJ, V. I. **Sur l'étude des forces naturelles productives de la Russie.** *Bull. de l'Acad. Imp. des Sci.* [*de Pétrograd*], Ser. 6, 1915, No. 8, pp. 679-700. [In Russian.]

WINSHIP, NORTH. **Petrograd.** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 13a, pp. 1-4. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

ZEMCOV, B. **Détermination des différences des longitudes Pulkovo-Paris.** *Bull. de l'Acad. Imp. des Sci.* [*de Pétrograd*], Ser. 6, 1915, No. 4, pp. 275-276. [In Russian; see also entry above under Backlund.]

ASIA

MANCHURIA, KOREA, JAPAN

—— **Forest Exploitation, Japan (Formosa).** *Board of Trade Journ.*, Vol. 93, 1916, May 18, p. 471. [Exports from the Mount Ari forests, opened three years ago, now amount to 3,000,000 cubic feet per annum. Recent exploration has revealed two similar timber resources situated respectively on the slopes of Mounts Hassen and Sansei. Together the newly discovered forests cover about double the area of those of Arisan, and they offer superior conditions for lumbering operations. Whereas the exploitation of the older forest necessitated construction of a 41-mile railroad up the mountain, the streams of the new areas will allow flotation of the logs to the place of shipment.]

HULBERT, H. B. **Japan and isothermal empire.** *Journ. of Race Development*, Vol. 6, 1916, No. 4, pp. 441-453. [By "isothermal" is meant lying in the same climatic zone, the thesis being that empires which encompassed regions strongly contrasted in climate were ephemeral.]

—— **Korea, Government General of, Annual report of the meteorological observatory of the, for the year 1914.** 188 pp. Chemulpo, 1915.

OMORI, F. **The Sakura-jima eruptions and earthquakes, II. (On the sound and ash-precipitation areas of, and on the level changes caused by, the eruptions of 1914, with historical sketches of earlier Sakura-jima outbursts.)** 180 pp.; maps, diagrs., ills., bibliogr. *Bull. of the Imperial Earthquake Investigation Committee*, Vol. 8, 1916, No. 2. [The intensity of the earthquakes and volcanic outbursts of Japan, and the accompanying loss of life, have led in recent years to a detailed study of these phenomena. This report has highly interesting chapters on related effects, as follows: Meteorological conditions at the time of the eruption of 1914; Propagation of sound waves which accompanied the Sakura-jima outbursts of 1914; Abnormal changes in height of water of Kagoshima Bay due to the Sakura-jima eruption of 1914; Level change and horizontal displacement of the ground caused by the Sakura-jima eruption of 1914. The maps and graphs are high-grade in every respect. The rise of the ground in a number of instances coincident with volcanic activity is concluded to be the result of upward pressure of injected magma, and the fall of the ground to the loss of the extruded material.]

SCIDMORE, G. H. **Japan.** 8 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 55a. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

WATARAI, TOSHIHARU. **Nationalization of railways in Japan.** 156 pp.; map, bibliogr. *Columbia Univ. Stud. in Hist., Econ. and Public Law*, Vol. 63, 1915, No. 2. $1.25. 10 x 6½.

CHINA

HARDING, GARDNER L. **Present-day China: A narrative of a nation's advance.** 250 pp.; ills. Century Co., New York, 1916. $1. 7 x 4½.

The history and problems of republican China, its hopes and achievements, are

summed up in true journalistic style in this small volume. It is the author's conviction that the republican movement is no mere flash in the pan, but that the time has come when the Chinese are beginning to think for themselves. This optimistic view imparts its bright coloring to the sketches, which portray an enormous and sluggish mass of illiterate beings upon whom Western ideas of self-government are suddenly thrust. And yet one has only to read between the lines to realize that the Chinese revolution had little meaning to the natives and that the short-lived republicanism of their country was the work of a small band of inspired idealists who had practically no community of aims or thoughts with their countrymen. It is to be regretted that hardly any reference is made to the part played by American influences in these Chinese changes.

The topic of foreign covetousness is of course discussed by Mr. Harding. Japan's growing control and the dealings of European powers form the theme of his last chapters. Although the alien activity is presented as political, one cannot help feeling that a sketch of its economic background would have enlightened the reader more effectively. In this field the railway question alone is taken up.

—— **China, Report on the foreign trade of: Abstract of statistics.** 93 pp. *China Maritime Customs Statist. Series Nos. 3 and 4 (Returns of Trade and Trade Repts.)*, 1915, Part 1. Shanghai, 1916.

—— **Port trade statistics and reports: Central ports (Shanghai to Wenchow).** pp. 727-930. *China Maritime Customs Statist. Series Nos. 3 and 4 (Returns of Trade and Trade Repts.)*, 1915, Part 2, Vol. 3. Shanghai, 1916.

—— **Port trade statistics and reports: Northern ports (Aiguń to Kiaochow).** 407 pp.; map, diagr. *China Maritime Customs Statist. Series Nos. 3 and 4 (Returns of Trade and Trade Repts.)*, 1915, Part 2, Vol. 1. Shanghai, 1916.

—— **Port trade statistics and reports: Yangtze ports (Chungking to Chinkiang).** pp. 409-726. *China Maritime Customs Statist. Series Nos. 3 and 4 (Returns of Trade and Trade Repts.)*, 1915, Part 2, Vol. 2. Shanghai, 1916.

Ward, F. K. **Glacial phenomena on the Yun-nan-Tibet frontier.** Maps, diagr., ills. *Geogr. Journ.*, Vol. 48, 1916, No. 1, pp. 55-68.

Malay Archipelago, including the Philippines

Coronas, José. **General weather notes.** Maps, ills. *Meteorological Bull.*, 1915, Oct., pp. 195-225. Manila Central Observatory, 1916. [The two severe typhoons of October, 1915, are described in detail.]

Fortgens, J. **Vier weken zendingsarbeid op Taliabo.** Ills. *Mededeel. Nederland. Zendelinggenoot.*, Vol. 60, 1916, No. 1, pp. 49-74. [Missionary trip in the island of Taliabu east of Celebes.]

Koningsberger, J. C. **Java, zoölogisch en biologisch.** Aflevering 11-12 (= pp. 493-663). Drukkerij Dep. v. L. N. en H., Buitenzorg, 1915. Fl. 2. 9½ x 7. [Final instalment of work.]

Masó, M. S. **Historia del Observatorio de Manila, fundado y dirigido por los Padres de la Misión de la Campañía de Jesús de Filipinas, 1865-1915.** 210 pp.; map, diagrs., ills., bibliogr. E. C. McCullough & Co., Manila, 1915. 10½ x 7. [Founded by the private enterprise of the Jesuit fathers, the observatory, though subsidized in turn by the successive Spanish and American governments, has remained under the skilled directorship of the order. Location in the center of origin of the Pacific cyclones confers exceptional value on the work of the station.]

Mayer, A. G. **Java, the exploited island.** *Scientific Monthly*, Vol. 2, 1916, No. 4, pp. 350-354.

—— **Meteorological observations made at the secondary stations during the calendar year 1913.** 331 pp. *Ann. Rept. of the Weather Bureau [of the Philippine Is.]*, Part. 3. Manila, 1915.

Moses, Bernard. **Early days in the Philippines and the problem of the friar lands.** *Rept. of the 33rd Ann. Lake Mohonk Conference on the Indian and Other Dependent Peoples, Oct. 20, 21, and 22, 1915*, pp. 87-90.

—— **Philippine Islands.** 7 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 80a. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

—— **Philippine Islands, foreign commerce of the, Annual report of the Bureau of Customs and of, for the year ended December 31, 1915.** 199 pp.; diagrs., index. Bur. of Customs, Dept. of Finance and Justice, Manila, 1916.

—— **Philippine Islands, Foreign commerce of the, January-December, 1914, July-December, 1913.** 164 pp.; diagrs., index. Bur. of Customs, Dept. of Finance and Justice, Manila, 1915.

PRATT, W. E. **The occurrence of petroleum in the Philippines.** Map. *Econ. Geol.*, Vol. 11, 1916, No. 3, pp. 246-265. [The presence of petroleum in certain of the Philippine Islands became known before the close of the Spanish régime. American investigation has extended the known area of occurrence, and lately examination has been made of the product and its natural residues. Apparently the oil is similar to that obtained from beds of the same age (Miocene) and same general character in adjacent countries where it is exploited on a profitable basis. Although no definite commercial prospects can be held out, indications are such as to warrant more detailed exploration.]

RIVERS, W. C. **The Moro as a factor in the Philippine problem.** *Rept. of the 33rd Ann. Lake Mohonk Conference on the Indian and Other Dependent Peoples, Oct. 20, 21, and 22, 1915*, pp. 103-106.

TAYLOR, F. W. **Agricultural development in the Philippines.** *Rept. of the 33rd Ann. Lake Mohonk Conference on the Indian and Other Dependent Peoples, Oct. 20, 21, and 22, 1915*, pp. 90-98.

TUTHERLY, WILLIAM. **The Philippines in world politics.** *Rept. of the 33rd Ann. Lake Mohonk Conference on the Indian and Other Dependent Peoples, Oct. 20, 21, and 22, 1915*, pp. 124-133.

VAN DER HAAS, P. A. H. **Een voorstel en een paar vragen in het belang der Javasuikerindustrie.** *De Indische Gids*, Vol. 38, 1916, No. 2, pp. 149-167. [Sugar industry of Java.]

AUSTRALASIA AND OCEANIA

AUSTRALIA, NEW ZEALAND

CAMBAGE, R. H. **The mountains of eastern Australia and their effect on the native vegetation.** Map. *Journ. and Proc. Royal Soc. of New South Wales*, Vol. 48, 1914, Part 2, pp. 267-280. Sydney, 1914.

The mountain ranges of eastern Australia, averaging 3000-4000 feet in height, and from 10 to 300 miles from the coast, exercise an important influence on climate and vegetation. East of these ranges, through the effect of the mountains in causing precipitation from the easterly rain-bearing winds, the climate is moist and the characteristic type of vegetation is jungle or "brush." The conditions most essential to the development of "brush" are abundant rainfall and sufficient warmth; it is naturally excluded from the plateaus west of the dividing ranges where the climate is dry and the winters are cold. Here the prevailing type of vegetation is open forest or low scrub. Wherever gaps across the ranges too low to effect precipitation occur, the "brush" vegetation is absent and the interior types approach the coast. The flora of the plateaus includes an antarctic element which is unable to flourish in the lower coastal strip.

GEORGE E. NICHOLS.

MASSON, E. R. **An untamed territory: The Northern Territory of Australia.** xii and 181 pp.; maps, ills. Macmillan & Co., Ltd., London, 1915. $2.00. 8 x 5½.

Simplicity and spontaneity of style and well-balanced observation create in this unpretentious narrative an admirable picture of life in the least-known section of Australia. In this region, where human affairs are little complicated as yet, geographic controls are easily recognized. They constitute the background of the narrative from the beginning, where one is immediately transported to the erstwhile "hopeless, unwanted land." "It is part of Australia, and yet utterly remote from the civilized states, separated from them by a fortnight's journey by sea; it is close to the East and yet not of the East. Only five days distant there is Java, with a swarming native population, with ancient temples and other relics of a historic past; to the north lies Manila, with palm trees and plantations; and in ten days' sail—less time than it takes to reach Sydney—there is Hong Kong, the very center of the Orient." Thence against the background of nature are portrayed various aspects of Port Darwin, where mingle varied human streams—white officials, Chinese traders, Malay pearlfishers, and aborigines from the bush. Excursions farther afield bring into view coasts as far as the mouth of the Roper River in the Gulf of Carpentaria and "out bush" as far as Oenpelli, home of a pioneer settler in the buffalo-hunting country, ground now made classical through the ethnographical researches of Baldwin Spencer.

—— **Adelaide Chamber of Commerce, Sixty-sixth annual report of the.** 132 pp.; ills. Adelaide, 1916.

ASTON, B. C. **The vegetation of the Tarawera Mountain, New Zealand. Part 1: The north-west face.** Ills., bibliogr. *Journ. of Ecology,* Vol. 4, 1916, No. 1, pp. 18-26.

—— **Australia, Early knowledge of.** *Victorian Geogr. Journ.,* Vol. 32, 1916, Part 1, pp. 31-41. Victoria.

BALL, L. C. **The wolfram mines of Mount Carbine, north Queensland.** 96 pp.; map, diagrs., ills. *Geol. Survey of Queensland Publ. No. 251.* Brisbane, 1915. [With a 7-page section on physiography, water supply, and timber resources, and a contour map on the scale of 1:4,000.]

CONDLIFFE, J. B. **The external trade of New Zealand.** Diagrs. *New Zealand Official Year-Book,* Vol. 24, 1915, pp. 858-962. Wellington.

—— **Diatomite from Australia.** *Bull. of the Imperial Inst.,* Vol. 14, 1916, No. 1, pp. 41-44. [The German source of infusorial earth, or *kieselguhr,* being cut off, attention is drawn towards the Australian deposits, of which the best known occur at Lillicur, northwest of Ballarat, Victoria.]

FRASER, MALCOLM, edit. **The New Zealand official year-book, 1915.** xii and 1004 pp.; maps, diagrs., index. John Mackay, Wellington, N. Z. 1915. 8½ x 6.

GRAY, G. J. **Geological reconnaissance of Arnheim Land.** *Bull. of the Northern Territory No. 14,* pp. 20-31. Dept. of External Affairs, Melbourne, 1915. [For illustrative map, see entry under H. I. Jensen, below.]

HUNT, H. A. **Australian monthly weather report and meteorological abstract: Annual summary, 1912.** Vol. 3, No. 13, pp. 623-686. Maps. Commonwealth Bur. of Meteorol., Melbourne.

HUNT, H. A. **Temperature departures in Australia, 1915.** Ills. *Symons's Meteorol. Mag.,* No. 601, Vol. 51, 1916, pp. 4-6.

HUTCHINS, D. E. **Australian forestry.** *Trans. of the Royal Scottish Arboricultural Soc.,* Vol. 30, 1916, Part 2, pp. 123-126. Edinburgh.

JENSEN, H. I. **Report on the geology of the country between Pine Creek and Tanami.** Maps. *Bull. of the Northern Territory No. 14,* pp. 5-19. Dept. of External Affairs, Melbourne, 1915. [The number of the *Bulletin* in which this paper appears is accompanied by a general geological map of the Northern Territory, 1:1,400,000, which may also serve to illustrate this and the two other individual articles listed in this section under G. J. Gray and R. J. Winters.]

KNIBBS, G. H., edit. **Census of the Commonwealth of Australia taken for the night between the 2nd and 3rd April, 1911.** Vol. II: Parts 1-8, of the detailed tables, 1073 pp.; Vol. III: Parts 9-14 of the detailed tables, pp. 1076-2296, index. McCarron, Bird & Co., Melbourne, [1914]. 13 x 9. [Part 8 in Volume II deals with the non-European races.]

LE SOUEF, W. H. D. **Aboriginals' culinary methods and kitchen middens.** Ills. *Victorian Geogr. Journ.,* Vol. 32, 1916, Part 1, pp. 1-11. Victoria.

MACLEOD, N. J. **Statistics of the State of Queensland for the year 1914.** Part 1: **Index.** xii pp. Part 2: **Interchange.** 143 pp. Part 6: **Local government.** 22 pp. Part 8: **Vital statistics.** 13 pp. Part 9: **Production.** 66 pp. Part 10: **Summary of statistics.** 14 pp. Brisbane, 1915. [Part 2 contains trade statistics; Part 6, area and population of towns and shires.]

—— **New South Wales, Annual report of the Department of Mines, for the year 1915.** 213 pp.; maps, diagrs., index. Sydney, 1916.

OSTENFELD, C. H. **Skildringer af Vest-Australiens Natur, saerligt dets Plantevaekst.** Map, ills. *Geografisk Tidskrift,* Vol. 23, 1915-16, No. 2, pp. 35-46; No. 4, pp. 132-148. Copenhagen.

SMITH, F. H. **Australasian markets for American lumber.** 48 pp. *Bur. of Foreign and Domestic Commerce Special Agents Series No. 109.* Dept. of Commerce, Washington, D. C., 1915.

SPEIGHT, R. **The lakes of New Zealand.** *New Zealand Official Year-Book,* Vol. 24, 1915, pp. 963-969. Wellington.

TAYLOR, GRIFFITH. **Initial investigations in the upper air of Australia.** 16 pp.; maps, diagrs. *Commonwealth Bur. of Meteorol. Bull. No. 13.* Melbourne, 1916.

TWELVETREES, W. H. **Reconnaissance of country between Recherche Bay and New River, southern Tasmania.** 38 pp.; maps, diagrs., bibliogr. *Tasmania Geol. Survey Bull. No. 24.* Dept. of Mines, Hobart, 1915. [The reconnaissance was undertaken with specific reference to reported indications of petroleum occurrence. This part

of the island is practically unknown. Since the first exploration by Captain James Kelly in 1815, when landing was prevented by the natives, its inhospitable shore-line has been penetrated only by a few hunters, fishermen, and prospectors. The prospects of oil occurrence, while not negatived by the report, are not regarded favorably.]

WALLIS, B. C. **The climate of New Zealand.** Maps. *Geogr. Teacher,* No. 43, Vol. 8, 1915, Part 3, pp. 179-183.

WINTERS, R. J. **Geological observations on the country between Pine and Newcastle Waters.** *Bull. of the Northern Territory No. 14,* pp. 32-41. Dept. of External Affairs, Melbourne, 1915. [For illustrative map, see entry under H. I. Jensen, above.]

POLAR REGIONS

ANTARCTIC

MOHN, H. **Roald Amundsen's Antarctic expedition, scientific results: Meteorology.** Diagrs. Reprinted from *Videnskapsselskapets Skrifter: 1. Mat.-Naturv. Klasse,* 1915, No. 5, pp. 1-78. Christiania.

Dr. H. Mohn, author of this report on the meteorological results of Roald Amundsen's Antarctic expedition, also made the official and complete report on the meteorological work of the Nansen Arctic expedition in the *Fram.* The volume is in two parts, the first dealing with the observations at Framheim, and the second with the observations made on the sledge journey.

The essential facts regarding the meteorological conditions at Framheim are these. August is the coldest month, with —34.2° Fahr. (—36.8° C.), and December the warmest, with —23.7° (—4.6° C.). There is no regular diurnal march of temperature during the dark season. Lower temperatures are more frequent at 2 P. M. than at 8 A. M. and 8 P. M. Even in the summer season, the temperature at 2 P. M. rises only 2° to 3.5° (1° to 2° C.) above the daily mean. The absolute maximum temperature was 31.6° (—0.2° C.), and the absolute minimum —74.2° (—59° C.). The mean annual temperature was —11.2° (—24° C.). The mean annual temperature of the latitude of Framheim in the northern hemisphere is 0.7° (—17.4° C.). The prevailing wind is east, is rather wet, and seems to be essentially an incurving cyclonic wind, coming from the sea. The minimum pressure in these cases seems to be towards the north or northwest, in Ross Sea. These easterly winds are relatively mild, having a temperature 11° (6° C.) above normal, and are accompanied by snow in 56 per cent of the cases. North and northwest winds are the wettest, and the driest wind is south. Gales are not frequent, and the maximum velocity was only 20 meters per second. Northerly winds were the cloudiest, and southerly the clearest. The most frequent cloud form was stratus, followed by cirrus and altocumulus. No rain fell. Snow came only on every fifth day. The greatest probability of snow was during calms.

The sledge journey across the great ice cap to the South Pole and back again gave a surprisingly large number of meteorological observations, which are naturally of the greatest interest. The maximum actual temperature observed between Framheim and the South Pole was 23.4° (—4.8° C.), and the minimum actual temperature was —66.3° (—54.6° C.). The direction of maximum frequency of the wind on the plateau was southeast. The warmest winds were from the sea and the coldest from the interior. Southeast winds brought the greatest frequency of snowfall. Stratus, cirro-stratus, and cirrus were the cloud forms most frequently seen. Cumulus was rare. The pressure and wind directions in December, 1911, indicated that in the higher regions, above 2000 and up to 2800 meters, there were "cyclonic movements of the air, with centers in the northeast quadrant, higher temperature, and a great deal of precipitation." This confirms the view of Meinardus, that the Antarctic anticyclone exists only in the lower strata, appearing emphatically only when sea-level pressures are considered. Owing to the great cold, the vertical decrease of temperature is so rapid that above a given level the pressure over the South Polar region must be lower than over the surrounding areas. Thus a polar cyclone overlies the lower anticyclone. R. DEC. WARD.

TAYLOR, GRIFFITH. **With Scott: The silver lining.** xiv and 464 pp.; maps, diagrs., ills., index. Dodd, Mead and Co., New York, 1916. $5.00. 9½ x 6½.

Because of the tragic fate which overtook the second expedition to the Antarctic of Captain Robert Scott, we have as yet no complete popular account such as exists for other Antarctic expeditions. "Scott's Last Expedition," which appeared in the usual two-volume form (reviewed in *Bull. Amer. Geogr. Soc.,* Vol. 46, 1914, pp. 281-285), included the diary of Captain Scott and the narrative reports of the leaders of the subordinate parties. Dr. Griffith Taylor, the geologist of the expedition and Physiog-

rapher to the Commonwealth of Victoria at Melbourne, has now supplemented these volumes by a personal narrative report, which supplies much new material that we may presume would have found a place in the report of the leader, had he lived to write one. To the many beautiful illustrations from photographs appearing in the earlier volumes, 67 full-page illustrations are here added of the same excellent quality.

To scientists it may perhaps appear that Doctor Taylor has introduced into the pages of his narrative some matters of rather trifling interest, though for this the excuse may be offered that such a volume is issued not primarily for men of science but for the general public and particularly for the members of the expedition and their relatives and friends. To this clientele personal touches possess an absorbing interest. The volume has been edited in the absence of the author from England by Mr. Leonard Huxley, who likewise edited the two volumes of "Scott's Last Expedition."

From a scientific standpoint the most important sections of the book are numbers III and VI, which describe the First Western Expedition (January-March, 1911) and the Granite Harbor Expedition (November, 1911, to February, 1912). Both of these expeditions were commanded by Doctor Taylor and had for their object the preparation of a map of the area west and southwest of MacMurdo Sound, of which area a rough reconnaissance map had been undertaken by Ferrar, the geologist of the first Scott expedition ("National Antarctic Expedition," Vol. I, map in cover). The preparation of this map by Taylor and his associates, though carried out under great difficulties, has supplied us with a piece of accurate cartographic work which is unique for the Antarctic regions. The area covered is more than a hundred miles in length, has an average breadth of perhaps thirty miles, and is drawn on the scale of five miles to the inch. This map was based upon theodolite measurements and plane-table sketches and has represented upon it more than a dozen newly discovered glaciers of considerable size, together with a larger number of subordinate ones, most of which have received names. Such glaciers represent various types which, because of the climatic conditions of the Antarctic continent, are in some sense peculiar to the region.

How peculiar Antarctic glacial conditions are, may perhaps be illustrated by Taylor's assertion that in a hundred miles of morainic debris which he traversed he saw but one scratched boulder. Upon the other hand his studies indicate that water streams are hardly so rare as has sometimes been supposed on the basis of earlier reports. Of special interest is Doctor Taylor's "palimpsest" theory of erosion by the modified outlet glaciers on the border of the continental ice sheet (pp. 174-175). Doctor Taylor holds that certain of the outlet glaciers are terraced as a result of the persistence of cwms (cirques) in some instances, and in others to the operation of the nivation process during a former retreat of the ice tongue up the valley. His studies of physiographic conditions within this special region have in part been treated with greater fullness in papers which appeared in the *Geographical Journal* from October to December, 1914. In confirmation of his view that cirques do not become entirely effaced when overridden by ice masses of the blanketing type, one should examine the plate at page 350 of the volume under review and compare it for additional confirmation with the map by Nordenskjöld of James Ross Island in West Antarctica (map 3, Vol. I, *Wissenschaftl. Ergebn. der schwed. Südpolar-Exp.*).

To the physiographer the scientific sections of the volume have exceptional interest because Doctor Taylor is one of the few trained physiographers who have studied with any care the borderland of either of the great continental glaciers. Of special interest to the geologist is the discovery within the Beacon sandstone of fish plates which fix this horizon with its layers of coal as in all probability of Devonian age.

William Herbert Hobbs.

Adams, Cyrus C. **The highest continent.** Maps, ills. *Amer. Review of Reviews,* Vol. 53, 1916, No. 5, pp. 600-602. [Antarctic Continent.]

Arctowski, Henryk. **Shackleton's South Polar expedition: The value of his scientific observations.** Map, ills. *Scientific American,* 1916, June 17, pp. 636 and 645. [Referred to on p. 57 in the article on Shackleton in the July *Review.*]

D[ines], J. S. **Seesaw of pressure, temperature, and wind velocity between Weddell Sea and Ross Sea.** By R. C. Mossman. *Monthly Weather Rev.,* Vol. 44, 1916, No. 3, p. 113. [Reprinted from *Science Abstracts,* Sect. A, Jan. 21, 1916. Reviewed in the April *Review,* pp. 323-324.]

Pirie, J. H. H. **Glaciology of the South Orkneys (Scottish National Antarctic Expedition).** Map, diagrs., ills., bibliogr. *Trans. Royal Soc. of Edinburgh,* Vol. 49, 1913, Part 4 (No. 15), pp. 831-863. Edinburgh. [Abstracted in the Nov. *Review,* p. 380.]

Rabot, Charles. **Le drame de l'expédition Shackleton dans la mer de Weddell.** Map. *La Nature,* No. 2233, 1916, July 15, pp. 37-40.

Scott, R. F. **The great ice barrier and the inland ice.** *Geogr. Journ.*, Vol. 46, 1915, No. 6, pp. 436-447. [Lecture delivered by Captain Scott to the members of his expedition at Cape Evans on June 7, 1911.]

—— **Shackleton Antarctic expedition.** *Scottish Geogr. Mag.*, Vol. 32, 1916, No. 5, pp. 242-247.

—— **Shackleton's, Sir Ernest, Antarctic expedition.** Map. *Nature*, No. 2432, Vol. 97, 1916, June 8, pp. 301-303.

MATHEMATICAL GEOGRAPHY

Surveying and Geodesy

Hohenner, Heinrich. **Über die rationelle Vermessung eines Landes.** 20 pp.; diagrs., ills. E. F. Wintersche Buchdruckerei, Darmstadt, 1913. 9 x 6.

In this address, Professor Hohenner describes in simple language the methods and development of surveying from the simple measurement of the area and boundaries of the town commons to a complete national geodetic survey. The pamphlet is illustrated by plates showing simple town plats, followed by base line and triangulation development and heliotrope and high signal towers used in the French, Prussian, and United States surveys. Mathematics is entirely avoided, thus making a very readable popular exposition of the subject. James Gordon Steese.

Bowie, William. **Innovations in precise-leveling methods in coast survey.** Ills. *Engineering News*, Vol. 76, 1916, No. 2, pp. 74.

Lane, A. C. **On certain resemblances between the earth and a butternut.** Diagr. *Scientific Monthly*, Vol. 1, 1915, No. 2, pp. 132-139.

—— **Metro manual: A hand book for engineers, containing technical information regarding the construction, adjustment, and use of transits, tachymeters, theodolites, alidades, levels, etc.** xl and 199 pp.; diagrs., ills., index. Bausch & Lomb Optical Co., Rochester, N. Y., 1915. 7 x 4½. [Concise and handy. Constitutes the ninth enlarged and revised edition of Saegmuller's "Vest Pocket Handbook."]

Reeves, E. A. **Night marching by stars.** Diagrs. *Geogr. Journ.*, Vol. 47, 1916, No. 6, pp. 440-455.

Roden, E. K. **Method of calculating the intersection point of St.Hilaire position lines.** Diagrs. *U. S. Naval Inst. Proc.*, No. 162, Vol. 42, 1916, pp. 481-491.

Roji, D. A. **La legua marina de Don Jorge Juan.** *Rev. Gen. de Marina*, Vol. 78, 1916, No. 6, pp. 751-765. Madrid. [Discussion of the length of the league as determined from the measurement of a meridional arc by the French Academy of Sciences expedition to Ecuador in the early eighteenth century.]

Uttmark, F. E. **A new system of navigation and nautical astronomy.** Diagrs. *Scientific American Suppl.*, No. 2111, Vol. 81, 1916, June 17, pp. 396-398.

PHYSICAL GEOGRAPHY

Geophysics

Bauer, L. A. **Solar radiation and terrestrial magnetism.** *Terrestr. Magnet. and Atmosph. Electr.*, Vol. 20, 1916, No. 4, pp. 143-158.

Dijk, G. van. **The magnetic character of the year 1915.** *Terrestr. Magnet. and Atmosph. Electr.*, Vol. 21, 1916, No. 3, pp. 149-150.

Duffield, W. G. **Apparatus for the determination of gravity at sea.** Diagrs. *Proc. of the Royal Soc.*, No. 644, Series A, Vol. 92, 1916, pp. 505-517. London.

Nichols, E. H. **Investigation of atmospheric electrical variations at sunrise and sunset.** Diagrs. *Proc. of the Royal Soc.*, No. 462, Vol. 92, 1916, pp. 401-408.

Simpson, G. C. **Some problems of atmospheric electricity.** *Monthly Weather Rev.*, Vol. 44, 1916, No. 3, pp. 115-122. [The problems presented relate to the radioactivity theory of the ionization of oceanic air; the earth's penetrating radiation; the origin and maintenance of the earth's charge; the nature and cause of ball lightning; the nature and origin of the aurora.]

Wolff, H. **Die Schwerkraft auf dem Meere und die Hypothese von Pratt.** Bibliogr. *Zeitschr. für Vermessungswesen*, Vol. 45, 1916, No. 1, pp. 1-22; No. 2, pp. 33-54.

Geology and Geomorphology

Friederichsen, Max. **Moderne Methoden der Erforschung, Beschreibung und Erklärung geographischer Landschaften.** 36 pp.; diagrs. *Geogr. Bausteine No. 6.* Justus Perthes, Gotha, 1914.

This interesting essay by a well-known German geographer is essentially a comparison of the methods of the American and German schools of geography as represented in the writings of William Morris Davis and Siegfried Passarge, in which the final honors are thought by the author to lie with the German school.

Friederichsen prefaces his essay with a short biographical sketch of Professor Davis. Then follows an analysis of Davis' method of treating geographical subjects, illustrated by examples taken from the latter's ''Erklärende Beschreibung der Landformen.'' Our critic doubts whether the method is so original as to deserve the prominence accorded it in geographical circles. In any case, the method has many faults, as Hettner and Passarge especially have pointed out. It is one-sided, for Davis treats landforms alone and pays no attention to their relation to the living world. Its terminology is bad, for, while a new terminology for a new science is both customary and necessary, Davis gives more new names than are needed and follows the doubtful procedure of designating stages of development in terms of man's life stages. The impropriety of the time-nomenclature is clearly apparent in the case of valley development, which is really dependent on the kind of rock, as shown by Hettner. The use of block diagrams by Davis' followers is regarded as dangerous, although Davis' own drawings have merit. And, finally, Davis' followers in particular have strikingly neglected to investigate the forces which produce landforms.

Friederichsen then observes that Passarge, clearly perceiving the weaknesses of Davis' method, has endeavored to direct students of landforms away from American toward less objectionable methods. A brief sketch of Passarge's life and writings is followed by an analysis of that author's ''Physiologische Morphologie,'' in which Passarge concludes that changes in landforms seldom take place in the simple manner supposed by Davis, that Davis' scheme of landform description is a too rapid generalization based on observations insufficient in number and made with insufficient care, and that the scheme suffers from the fact that preconceived ideas unfavorably influence the observer's description of natural features. Passarge's own preference is for a series of ''physiologic-morphologic'' maps, showing on separate sheets: (1) topography by contours, (2) degree of slope, (3) geology, (4) resistance of rock according to hardness and jointing, (5) permeability and resistance to erosion, (6) porosity of waste cover, (7) erosion forms and types of land waste, (8) resistance of the vegetal covering. Friederichsen admits the difficulty of preparing such maps and thinks they must be restricted to very limited areas, while Davis' method may be used for broader regions if its weaknesses are avoided. But Passarge is a true geographer and does not make one-sided physiographic investigations. He makes an important step in advance of Davis when he tries to analyze an entire district, including the animal and vegetable world, and especially man and his works.

It is always interesting to see ourselves as others see us. The comparison of methods would have a higher value, however, if both Friederichsen and Passarge possessed a somewhat clearer conception of just what is, and what is not, involved in the so-called American method and particularly Professor Davis' method of landform description.

Douglas W. Johnson.

Berg, Alfred. **Wie unsere Erde geworden ist.** 94 pp.; diagrs., ills. Theod. Thomas Verlag, Leipzig, [1915]. 40 pf. 6 x 4½.

Blanck, E. **Wie unsere Ackererde geworden ist.** 48 pp. Theod. Thomas Verlag, Leipzig, [1915]. 20 pf. 6 x 4½.

Cobb, Collier. **Pocket dictionary of common rocks and rock minerals.** 2nd edit. vi and 53 pp. Dept. of Geol., Univ. of North Carolina, Chapel Hill, N. C. 1915. 7 x 5.

Davis, W. M. **The principles of geographical description.** Diagrs., index, bibliogr. *Annals of Assoc. Amer. Geogrs.,* Vol. 5, 1916, pp. 61-105. [The most complete exposition yet published by Professor Davis of his methods and standards of physiographic description and interpretation. The essentials of parts of the essay have been published before, but the complete argument will undoubtedly become a classic in geographic literature. The only criticism we would offer relates to excessive fulness in the details of psychologic processes and their relation to physiography. A good deal of this matter will strike the average reader as more elementary than necessary. But the *mastery* of the whole paper by a young geographer will place him on one of the two main roads of the science.]

Harboe, E. G. **Jordklodens Undersøgelse med Sejsmograf.** *Geografisk Tidskrift,* Vol. 23, 1915-16, No. 5, pp. 188-197. Copenhagen.

Hecker, O. **Bericht über die Tätigkeit des Zentralbureaus der Internationalen Seismologischen Assoziation von April 1914 bis April 1915.** *Beiträge zur Geophysik,* Vol. 14, 1915, No. 2, third part, pp. 23-27.

Lämmermahr, L. **Die Höhle: Bilder vom Leben und den Wundern unter Tag.** 87 pp.; diagrs., ills. Theod. Thomas Verlag, Leipzig, [1915]. 8½ x 5½.

Navarro, L. F. **Estado actual del problema de la Atlantis.** Maps. *Bol. Real Soc. Geogr.,* Vol. 58, 1916, No. 2, pp. 178-212. Madrid.

Sapper, K. **Bericht über die vulkanischen Ereignisse der Jahre 1895-1913.** *Beiträge zur Geophysik,* Vol. 14, 1915, No. 1, first part, pp. 85-97; No. 2, first part, pp. 99-155.

HUMAN GEOGRAPHY

Economic Geography

Production

Swain, G. F. **Conservation of water by storage.** xvii and 384 pp.; map, diagrs., ills., index. Yale University Press, New Haven, 1915. $3.00. 10 x 7.

This discussion of matters of broader geographic interest is one of the results of the Chester S. Lyman Lectureship Fund for maintaining a course of lectures at Yale University on the subject of water storage conservation. Professor Swain has brought out clearly the larger features of the water resources of North America, and particularly of the United States. He considers the relation of water conservation to the use and protection of other resources, and the development of water power not merely from its technical aspect, but from its bearing upon existing legal and economic problems. The chapter upon forests and stream-flow is particularly valuable in reviewing the present attitude of the public and of political organizations toward the matter. It is shown that with the same total rainfall, and with topographic and geographic conditions identical, the total run-off in the stream and its distribution through the year may vary enormously.

The author calls attention to the heated discussion as to the effect of forests upon rainfall and stream-flow and notes that at the present time it is practically agreed that the effect of forests upon rainfall is small. He concludes that, aside from exceptions and special cases, the forests improve the regularity of river-flow; further, that the erosion of mountain slopes is the principal cause of the silting up of our rivers.

"That the cutting-down of forests has been followed by the drying-up of springs is a matter of such common observation that it may be substantiated by literally hundreds of statements." "As a result of this discussion and of the experience of centuries in older countries, there is no doubt that forests, especially on steep slopes, promote the regularity of flow of streams by facilitating underground storage."

The reader is cautioned against extreme views in either direction with regard to the effect of forests. The author calls attention to the fact that the flat lands having good soil are needed for growing crops and other purposes and will be so needed as population increases, reserving for forests the steep slopes and mountain sides and other areas unsuited for crops. The forests are valuable national assets, and, independent of their crop of timber, they regulate and prevent erosion.

In the discussion of floods, two lines of procedure are indicated, (1) that of flood prevention or mitigation, and (2) that of flood protection. Under the first are those efforts which retard the discharge into the river channels by means of the construction of reservoirs, also by forestation or by cultivation; next are those for enlarging the channel or increasing the slope by dredging, providing cut-offs, or improving the carrying capacity. The use of reservoirs as a method of flood prevention is considered, and reference is made to the elaborate studies of the Pittsburgh Flood Commission.

The book is a valuable contribution to our knowledge of the subject, making accessible many geographic or hydrographic facts and conclusions buried in government documents or diffused through current literature. F. H. Newell.

Schmüll, J. H. **Rubber en rubberhandel.** Diagr. *Tijdschr. Econ. Geogr.,* Vol. 7, 1916, No. 3, pp. 99-197.

Voorhees, J. F. **Climatic control of cropping systems and farm operations.** *Monthly Weather Rev.,* Vol. 43, 1915, No. 12, p. 612. [Author's abstract of a paper read at the Pan American Scientific Congress in Washington, Dec. 1915-Jan. 1916.]

INDEX

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ERRATA.

p. 26, line 2 from bottom: *for* Reconnaisance *read* Reconnaissance.

p. 75, line 22 from bottom: *for* University of Chicago *read* University of Illinois.

p. 77, line 10: *for* acocrding *read* according.

p. 79, line 1 in second column: *for* Gaudalupe *read* Guadalupe.

p. 84, line 12 from bottom: *for* Micellaneous *read* Miscellaneous.

p. 158, line 21 from bottom: *for* latter *read* later.

p. 232, lines 31 and 35 from bottom: *for* O'Neil *read* O'Neill.

p. 238, line 1 of first entry from bottom: *for* Bell, F. G., *read* Bell, A. F. G.

p. 235, lines 18 and 19 from bottom: *for* United States Permanent Commission of the International Geodetic Association *read* Permanent Commission of the International Geodetic Association to represent the United States.

p. 317, line 1: *for* Comissopolos *read* Comissopulos.

p. 371, in table, sixth prefecture, under Kiushin: *for* Miyagi *read* Miyazaki.

p. 391, line 2 of fourth item: *insert* 1916 *after* Series.

Additional Errata to Vol. I

p. 145, line 10 of first item: *for* 11,014 feet *read* 1,114 feet.

p. 275, line 19: *for* P. Cordier *read* H. Cordier.

p. 374, line 4: *for* 1:100,000 *read* 1:1,000,000 *and dele sentence, lines 8-12,* The map is on the same scale . . . . of the area.

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